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GENERAL SIR R. BIDDULPH, G.C.M.G., C.B., R.A., Quartermaster-General to the Forces, in the Chair.

DRESS AND EQUIPMENT, WITH PRACTICAL ILLUSTRATIONS.

By Colonel H. M. BENGOUGH, C.B.

"Nay, rightly considered, what is your whole Military and Police Establishment, charged at uncalculated millions, but a huge scarlet-coloured, iron-fastened apron?"—"Sartor Resartus."

THE influence of dress on mankind, generally and individually, admits of no question. It has been set forth, in I suppose I may say immortal language, by the learned and humorous Professor Herr Teufelsdröckh, in Carlyle's inimitable satire. But interesting as is the study of the general question, we are not concerned to-day with dress as an historical landmark, or as an index of national or of individual character, but in its relation to the bearing of arms; and in this direction also our researches must not be too far-reaching, or we shall find ourselves stranded on the barren shore of primitive unclothedness, or lost in the mazes of mediæval armour; or again to quote the Professor, "in the mysteries of buff-belts, complicated chains and gorgets, huge churn-boots, and other riding and fighting gear, which have been bepainted in modern romance, till the whole has acquired somewhat of a sign and post character."

Dress and Tactics.—It is no doubt interesting, and not without a certain use, to trace the changes in the soldier's dress *pari passu* with the changes in weapons and tactics. It may, indeed, be said that a history of military dress throws many a side light on the tactics of any given period. We see, for instance, how in the day of the sling and spear, freedom of movement was preferred to defensive bodily protection, when individual fighting represented all that there

then was of tactics. With the introduction of improved weapons came the armour of the Roman soldier, and the practice of manœuvring in formed bodies; the bow and arrow brought a lightening of the armour and the dawn of line tactics; the introduction of firearms gradually drove armour out of the field, until now it only survives in the cuirasses and metal helmets of modern heavy cavalry.

That the present dress of our soldiers leaves nothing to be desired, few, I venture to think, will affirm; but in this, as in other respects, great strides towards real efficiency have been made by us of late years.

There are some among us who can I daresay remember with me the days when we sent a soldier into battle in a coat as tight as tailor's art could make it, with no skirt or protection for the legs, but with two ridiculous little tails behind, which tails, by the bye, are reproduced in modern costume, and still retain the two little buttons that remind us that these tails are emasculated skirts of a hunting frock, the buttons on which were used, when riding, to loop up the long skirt. In addition, the warrior's head was kept well up by a stiff stock; and yet in this travesty of a soldier's dress we won battles.

Origin of Uniform.—The origin of the several parts of our present uniform is often curious. The genealogy of the familiar cocked hat can be readily traced. Its progenitor was the graceful cavalier hat of Charles I, with its floating ostrich plume. Its broad brim being found inconvenient, first one and then two flaps were turned up, until about the time of Queen Anne, when the third flap was turned up and the regular cock formed. Cocked hats had various kinds of cocks: there was the "military cock and the mercantile cock, a hat cocked like a water spout, and another like a minced pie." The most serviceable type was the low-crowned hat of the Duke of Wellington; but all the family possess most of the qualities that a soldier's hat should not have, and I, for one, shall rejoice when the existing representative shall find an appropriate resting-place among the interesting antiquities preserved in this Institution.

I have for long desired to trace the origin of the Highland kilt and plaid. When in Scotland last autumn I chanced on the following, at least reasonable, derivation. It has certainly the merit of antiquity, for it takes us back to the time when the primitive Gaul clothed himself in a single raiment which he wound round his loins, finishing over his shoulders, as is still the custom in the East. Strange to say it was reserved for a practical Saxon to evolve from this primitive costume the present picturesque garb of our Highlanders, for a large southern manufacturer is said to have suggested, for the convenience of his workmen, the severance of the upper portion of the robe from the lower, thus creating the graceful plaid and kilt—now, alas! as rarely seen in the Highlands as is a steeple hat in Wales, or a labourer's blouse in England.

Regimental Distinctions.—Time will not allow me to dwell on the origin of the dress distinctions of regiments—now, I regret to say, waning under the influence of the levelling policy and the petty

economies of the present day. As an old regimental officer, I retain my faith in them, and believe that there is more virtue in a bit of ribbon or a brass button than the clippings of the penny wise economist will ever make good.

There are to be found occasionally, I fear, within our War Office walls certain individuals to whom sentiment does not appeal, of whom it may be said that

> "A primrose by a river's brim,
> A yellow primrose is to him,
> and nothing more."

But sentiment is the very essence of a soldier's life; it enables him to disdain death, to face the pitiless storm of bullets; it, in short, converts an ordinary mortal into a hero.

The origin of some of our regimental distinctions is often obscure and not always of a very romantic nature, but all are valued and honoured by the regiments that possess them.

The following, as an example, is the origin of the knot of black ribbon, called the "Flash," worn at the back of the collar of the coat by the officers and the staff sergeants of the Royal Welsh Fusiliers:—

"The Royal Welsh Fusiliers being the last regiment in the army who wore the wig, retained the ribbons in imitation of the queue bag. On their arrival from Gibraltar, the Inspecting General ordered the 'Flashes' to be discontinued, as not being according to regulation. Lieutenant-Colonel Harrison immediately telegraphed to the colonel of the regiment, Sir W. Gordon, and received the following reply:—

"Horse Guards,
"——— 1834.

"SIR,

"I have great pleasure in transmitting to you the accompanying letter from the Adjutant-General, conveying the King's gracious approval of the 'Flashes,' now worn by the officers of the Royal Welsh Fusiliers, being henceforth worn and established as a peculiarity whereby to mark the dress of that distinguished regiment.

"In thus making known to you this gracious mark of His Royal Majesty's favour, and in desiring that the enclosed letter may be duly registered in the records of the regiment, I have no doubt that it will be felt by the regiment, as it ought to be, both as an honourable proof of His Majesty's approbation, and as an inducement to use their best endeavours to merit a continuation of such gratifying distinctions.

"I have the honour to be, Sir,
"Your obedient servant,
"W. GORDON, *General.*"

A regimental historiographer adds: "Since when, it is useless to say, the 'Flash' has been fondly cherished, and still remains, aye, and ever will remain, a proud mark of distinction, whereby a Royal Welsh Fusilier may be distinguished amongst all men."

"The 28th Regiment (now the Gloucestershire Regiment), for cool intrepidity in the campaign in Egypt on 21st March, 1801, when being attacked and surrounded by the French, the rear rank was turned about, and by steady fire repulsed the enemy," were granted

the distinction of wearing the badge of the Sphinx on the back of the head-dress, as well as on the plate in front, a distinction that the regiment still enjoys.

The following are some others among the many treasured distinctions in the dress of regiments :—

The bearskin of the "Greys," granted for capturing the colours of the "Régiment du Roi" at Ramillies.

The red and white hackle of the old 5th (Northumberland) Fusiliers; origin not known.

The "In Memoriam" Royal wreath of the 24th South Wales Borderers.

The "Royal Tiger" of the Leicestershire Regiment; a standard bearing a tiger having been captured by the 17th Regiment during the Nepaulese War.

The "Minden Roses" of the old 20th (now the Lancashire Fusiliers).

The "Guards Star" of the 29th (Worcestershire Regiment).

The "Laurel Wreath of Fontenoy" of the old 34th (the Border Regiment).

The "White Feather," souvenir of Wolfe's Maida, of the Royal Sussex, late 35th, Regiment.

The "Splash" on the buttons of the old 62nd, of which tradition says that at the French invasion of Ireland in 1760, their bullets being expended, the men loaded with their coat buttons.

These are only a few glorious memorials out of many. Almost every regiment possesses its own; some trifling in outward form, but all firmly rooted in regimental tradition, and forming a powerful moral guarantee for gallant conduct and discipline.

Requirements for Uniform.—In discussing the general question of a suitable dress and equipment for the British soldier, we are at once confronted by the difficulty that no universal pattern can possibly be found suitable for an army whose proud boast it is to be the guardian of an Empire on which "the sun never sets," and which has to do both fighting and garrison duty in all quarters of the world. I propose, therefore, to confine my remarks to a dress suitable to a temperate climate, leaving such extreme conditions as the climate of Canada or Northern Asia, and that of the tropics, for such modifications as experience has shown to be desirable.

I think that most soldiers will agree that all branches and ranks of the Service are over-burdened with a multiplication of "orders" of dress. What we want to attain to is a reduction of these "orders" to two or, at the most, three, viz. :—

1. A fighting dress.
2. A review or "walking-out" dress.
3. A fatigue dress (if necessary).

The requirements of a fighting dress are, ease and freedom to the wearer, as little visibility as possible, durability, and simplicity.

Those for a review dress would be smartness and neatness, such an appearance, in short, as will make the wearer think much of himself, and make others think much of him. The influence of dress on all

of us is greater, perhaps, than we are inclined to allow. Who does not, for instance, feel an excusable sense of satisfaction as he strolls through the Park in a well-fitting frock coat, or as he appears at the cover side correctly turned out from his hat to his boots? The Great Duke used to say that his dandies were his best fighters, and so it is with all ranks. Encourage in every way a soldier's self-estimation, and you make him a better man and certainly a better soldier.

The few suggestions that I have ventured to make below for improvement in the appearance and comfort of the soldier's dress are not revolutionary, nor are they, I think, extravagant or impracticable. They would, I feel sure, be appreciated by the soldier, and my hearers will, I doubt not, agree with me that the soldier is well deserving of, and amply repays by increased contentment and cheerfulness, any attention to his comfort and well-being.

Colour of Uniform.—Having advanced so far then as to limit the soldier's kit to, at most, three suits, one of the first points to decide will be the colour of our uniform. Much may be said, I am aware, especially in these days of smokeless powder, in favour of discarding our national scarlet for some less conspicuous colour, at any rate in the field. I have considered the question carefully, and, so far as my opinion goes, I confess I "plump" for red. It is a question in which due weight must be given to moral, or, if you like so to call it, to sentimental feeling.

The origin of our scarlet uniform, though of ancient, is of a somewhat prosaic source. Scarlet and blue became the Royal colours in accordance with the tinctures in the armorial ensign of the Royal Family of England from the time of Edward, and so, in Queen Anne's reign, red was definitely adopted for the uniform of the British army, Royal regiments wearing blue facings.

Thus red has been associated for centuries with the gallant deeds of our army; it has been immortalized by Kinglake's "thin red line," and perhaps in even more lasting form in Rudyard Kipling's "thin red 'eroes."

The advantage of readily recognising one's own soldiers in battle is an important one, the more so now that smokeless powder will make it so difficult for a commander to follow the movements of his own or of the enemy's troops, and due weight must be given to the moral effect of a charge of horse or foot in England's national colour, especially against an uncivilized foe.

As regards visibility, red compares favourably with all the darker shades. In some experiments carried out in France to test the relative visibility of colours, it was found that the least conspicuous was a French grey, and one of the most conspicuous the so-called "invisible green" worn by our Rifle Brigade; scarlet was well up in the scale, much depending, of course, on the background and the weather. What makes our men so conspicuous on a field day is not the red coats, but the white belts on the red coats, and the brass on the helmets.

We may note, too, that none of the Continental armies have as yet

discarded their national colours in favour of a less visible shade, although I hear that the Austrians are thinking of adopting a light grey for their uniforms. Our own attempt in 1884 to introduce a drab or "khaki" uniform at home for infantry met with little sympathy or success.

German System of Clothing.—It may be of interest if I quote here, briefly, the German system of clothing.

Each man on joining has five complete suits of clothing, but all these are not in his possession, but are kept in store for him.

1. He has a rough working suit, which he wears about barracks, at manœuvres, &c.
2. A better suit, which he wears on parades, at drills, &c.
3. A suit which he wears on church parades, and for walking out.
4. A special suit, which is only issued to him on a grand occasion, such as a review by the Emperor or other great personage, and which he may never see during his service.
5. The complete "service kit," which is labelled with his name and kept in store, and which he will never see until the eve of mobilization.

All clothing belongs to the State, nothing to the soldier; but he is held responsible for all things in his possession.

Suggestions for a suitable Uniform.—Although I have assumed that a soldier must have a dress for work and a dress for show, I do not advocate any great difference in pattern between them, but only an addition of ornament to the latter. The dress that a soldier habitually wears should be the one in which he fights. There is something incongruous in a soldier wearing a holiday dress in peace-time and an entirely different dress in war.

The question is, cannot a uniform be of good appearance and at the same time serviceable for a soldier's work? I think so. We must, however, begin by disabusing ourselves of the idea that a soldier's dress to be smart must be tight. It is this striving after extreme tightness that is at the bottom of all the difficulty. But it is a relic of the dark ages—of the days of pigtails and pomatum, of stocks and starch. George IV said that "in a military dress a wrinkle is unpardonable, but a seam admissible"; the consequence was that the coats of the private soldiers, as well as those of the officers, were made so tight that they could hardly get into them.

To show the extent to which absurdities in dress can be carried, it is related that "when the Duke of Kent commanded at Gibraltar, on a field day being ordered, and there not being sufficient barbers in the garrison to attend the dressing of the wigs of all the officers in the morning, the seniors claimed the privilege of their rank; the juniors, consequently, were obliged to have their heads dressed the night before, and, to preserve the beauty of the artistic arrangement of their wigs, pomatumed, powdered, curled, and clubbed, these poor fellows were obliged to sleep all night on their faces."

But times and fashions have changed. Common sense has, nowadays, a word to say on all questions of modern costume, whether military or millinery—not so distinct a question as may appear at

first sight; for whether ladies do us the honour of copying us, or whether, counting imitation the sincerest flattery, we humbly endeavour to imitate them, I cannot say; but from the petticoat and *juste de corps* of Bluff King Hal, down to the tailor-made hussar jacket and smart tailed coat of the present day, the dress of soldiers and of ladies has been intermingled in decidedly comical fashion.

But, to return, granting that tight-fitting clothes are not suitable for a soldier, I do not think that it should be difficult to find a soldier-like, good-looking, and workmanlike dress.

A lifeguardsman, distinguished by his prowess at Waterloo, when asked, if again engaged, what dress he would prefer, said, "I should like to take off my coat and turn up my shirt sleeves over my elbows."

Without going quite so far in search of ease, I think that all that can be desired will be found in a Norfolk jacket with plaits in front so as to give complete freedom to the upper part of the body, and to allow of a "jumper" or Cardigan jacket being worn underneath when required, with a pocket on each breast, in compartments, to carry each 10 rounds of ammunition, an inner pocket over the left breast for the field bandage, and a pocket with flap in each skirt in front to carry ammunition when going into action. All outside pockets to fasten with buttons, and all buttons to be removable to admit of being cleaned.

The best coat, for reviews and "walking out," should be of scarlet cloth, and should have additional lace or piping, and the peaked Austrian cuff as formerly; the working or service dress being of serge, with a rolled collar, as in the Italian army.

I would earnestly advocate the restoration of facings on cuff and collar. The value of facings is, I think, hardly appreciated. They are, like all regimental distinctions, of great service in maintaining *esprit de corps*. Who can say how much of the grand prestige that distinguishes our Scotch regiments is not due to the distinction in their dress? Facings have, moreover, a real practical value on the battlefield in enabling men of the same regiment readily to recognise each other, and to be recognised by Staff officers. I can well remember the satisfaction with which, in former days, when sent as "galloper" with an order to, say the colonel of the old "19th," I would hail a wearer of the "Howard Green."

In the German and Russian armies the division and army corps to which a man belongs can be easily recognised by the colour of his shoulder straps and cap band.

A suggestion has lately been made that our companies should wear a piece of cloth at the bottom of the collars of the coat of different colours, by which the units might be distinguished in the field. The idea seems to be worth consideration. In the German army, battalions and companies are distinguished by differently coloured sword knots fastened to the bayonet frog.

As regards the restoration of regimental numbers, I would not do anything to disturb the feeling of *esprit de corps* that is growing up daily around our present territorial system. For clerical purposes a numeral distinction is convenient, and the adoption of the terri-

torial district numbers, 1st, 2nd, 3rd, and 4th battalions, as in the Army List, would be the simplest plan; this would restore their old numbers to nearly two-thirds of the army.

I would have no more white belts; for all duties under arms brown leather accoutrements should be worn, and for walking out and for full dress I would suggest a webbed belt or girdle, as is worn by Lancer regiments, which might be red and white or blue and white for cavalry, blue for artillery, and crimson for infantry, with the addition of a fringe or tassel on the left side for non-commissioned officers and officers, that of the latter being of silk. This would be better in many ways than the present "buff" belts, which require pipeclay to keep them clean, and are, besides, a rather too handy weapon for young soldiers. I have had a belt something like what I describe made up for you to see.

On all parades for manœuvres, officers and men should turn out exactly as they would on service, the men with buff or brown leather belts, the officers with "Sam Browne" sword-belts, with wooden sword scabbards covered with brown leather, and with field-glasses and revolvers on the waist-belt.

If, as I understand, a difficulty would be experienced in providing brown leather equipment for the whole army, the infantry buff belts might continue to be used; but I would have no more pipeclay; all belts should be dyed grey or "khaki" colour.

I would make the same principles of dress applicable to all branches of the Service, although I would advocate no radical change in the dress of the horse artillery, hussars, and other special corps, only stipulating that the dress, whatever it is, should be made perfectly easy and suitable for active movement on horse or on foot.

I propose now to take the more important articles of dress and equipment *seriatim*, and to discuss any improvements of which they may appear susceptible, only premising that, in the case of the mounted branches in which I have not had the honour of serving, my remarks, when original, are intended mainly to evoke the opinion of officers who have practical experience of the requirements of those arms.

Cavalry.

Head-dress.—The principal requisites for a head-dress for cavalry are, I take it, lightness, comfort, good ventilation, to afford protection from sabre cuts and from the weather, and a handsome appearance.

No one, I suppose, would urge that these requirements are satisfactorily fulfilled by the hussar busby, the lancer cap, or the dragoon helmet; but the two former, at least, are each so intimately associated with its own particular arm that I doubt any change being popularly received.

Indeed, a head-dress that fulfils all the above requisites will be hard to find; but I think that what approximates the nearest to what we want will be found in the pattern of helmet worn universally by the British cavalry and artillery in India, known as "Hawke's" pattern. It should have a metal button-shaped top, and metal pieces

front and rear and on either side, from which a sword cut would glance off; the rim might also be strongly metal-bound. Cork is undoubtedly, I think, the best material for a soldier's head-dress; it is light, comfortable, can be easily ventilated, resists the sun better than any other substance, except perhaps pith, and has a far greater power of resistance against a sword cut than would be supposed.

The colour should be French grey, or some similar shade. If it be desired to use the same helmet for service and for ceremonials, a handsome front ornament with badge and number of regiment, and a spike or horse-hair plume might be added.

The "service" cap lately issued to our dragoon regiments, of which I have a pattern here, appears to be a useful cap for the field. It sits well on the head even when moving fast, and can be easily stowed away. The night-cap arrangement, though ingenious and excellent in theory, is not, I think, likely to prove a success in practice. Our soldiers like, even on service, to turn out smartly, and the same cap cannot well combine day and night duties. It is only in very cold weather in bivouac that a night-cap is required, and then a Balaclava cap (woollen night-cap) is far more comfortable and weighs very little. A smarter and neater looking cap than the above, but of a somewhat similar pattern, is what is wanted for undress home service.

Coat.—A scarlet frock has also been lately issued to dragoon regiments for service and manœuvres, which, together with the "service" cap just alluded to, I am enabled, by the courtesy of the Clothing Department, to show you this afternoon. It is a step in the right direction, but not all that could be desired. It is not loose enough in the body to admit of free movement of the arms. A Commanding Officer of a heavy dragoon regiment, writing to me, says that his "lusty troopers, wielding their new weapon, the lance, vigorously at drill, have caused a good many 'splits' down the right rear of the frocks."

Something more of the Norfolk jacket pattern, with the addition of shoulder chains or scales, would be better.

Whilst the above was in press I have learnt that an admirable "service" jacket, much as I have described, has been sanctioned for officers of cavalry and artillery. I have been favoured with one for our inspection this afternoon, which has been made up by Messrs. Daniells, of Woolwich, for the pattern room at the War Office. It is made of home serge material, and I only hope that it may be quickly followed by a similar pattern for all ranks and branches of our army.

Boots.—The present knee-boot, with lacing over the instep to facilitate putting it on and off when wet, is a serviceable, good-looking boot, but it is not suited for dismounted work, and even with the addition of the lacing in front is difficult to put on and off when wet, unless made loose in the upper part. I remember Sir Evelyn Wood telling me that he rode through the Blood River in South Africa in a pair of ordinary jack-boots, and found no difficulty in getting them on and off afterwards. Still, I think that to have to pull a pair of damp boots over a pair of damp socks on a damp morning with the trumpet sounding "boot and saddle" is not a pleasant experience.

Putties are now generally used by cavalry and artillery in India, and are, I know, very favourably thought of by a large number of cavalry officers; I therefore express my opinion regarding them with diffidence. Personally, I think them a most unsightly leg covering for a mounted man; they are troublesome to put on properly, especially so in the dark, are liable to come unwound in riding, are hot and uncomfortable in hot weather, and stop the circulation if wound too tightly. I can only imagine that they have become popular from the feeling that some modification of the knee-boot is required with the increase of dismounted duty now expected from cavalry.

A gaiter-boot that admits of the lower part (detachable) being worn with overalls or for fatigues as high-lows, and yet is a good riding boot, giving play at the ankle and consequently comfort in walking, that can be easily taken off and put on, however wet, is simple in adjustment, and is, at the same time, smart in appearance, must, I think, be allowed to possess most of the requirements of a cavalry boot. Such a boot is the "Mounted Service" boot, of which I have a pair here, this afternoon, for your inspection.

It is the invention of a cavalry officer, and seems to me to be just what is wanted for a mounted soldier.

An officer, writing from Rome in the last number of the "R.A. Inst. Journal," says that "in the Italian cavalry and horse artillery, the non-commissioned officers and men wear a black leather sort of gaiter (cut to resemble high boots), ankle boots, and heel spurs; they are well made, and look very like knee boots, and have some advantages over these, especially when on active service, in camp, or on the march."

We have at the present time amongst us some of our Colonial troops, dressed, as we should expect to find them, in a workmanlike and practical fashion.

The N.S. Wales Lancers, for instance, have a working dress consisting of a "khaki" jacket with patch pockets, Bedford cord pantaloons, soft felt bush hat with red puggaree and green feather, brown gauntlets, knee-boots, and valise.

Sword how best carried.—The sword is now carried on the saddle by cavalry and artillery. This arrangement has undoubted advantages, but the awkward fact remains that a trooper or horse artilleryman, whose horse may be shot or may fall with him, finds himself separated from all his arms, and is, for the moment at least, absolutely defenceless. Several plans have been proposed to meet this difficulty, such as adding a revolver to the already considerable armament that a trooper now carries and has to learn the use of, or devising some means of carrying the carbine on the person when going into action.

There are objections to both of these plans; a solution of the difficulty would, I think, be found in the adoption of the "Sam Browne" belt, by which a sword can be carried quite comfortably mounted, and with no great inconvenience when dismounted, retaining the arrangement for carrying the sword on the saddle for marches, &c., as it can be shifted very readily from the frog on the shoe case to the

frog on the sword-belt when desired. The shoulder-belt should be provided with open pockets, in compartments, for 10 rounds of ammunition, and there should be two covered cases on the waistbelt for 20 rounds more.

Gloves.—Gauntlets are, I think, preferable to gloves for all mounted men, including Staff Officers. They look more soldierlike, and can be taken off and put on much more readily than gloves, a great point for a mounted man who may have at any moment to use his pocket-book, make a sketch, or use a compass.

The issue of a woollen glove or gauntlet for cavalry and artillery in cold weather is very desirable. The Austrians have just provided the whole of their cavalry with a woollen glove, furnished with a covering of leather or strong ticking between the fingers.

Field-glasses and Revolvers.—Field-glasses and revolvers should be carried by all officers on all parades in "service" order. The former on the sword-belt or on the off-side of the saddle, but not on the shoulder-belt; nothing is more uncomfortable than a pair of heavy field-glasses bumping up and down on the back when galloping, and small glasses are useless. A good telescope is a very useful adjunct to a cavalry or artillery officer.

Wallets.—The new pattern flexible wallet now being introduced for officers of cavalry and artillery in the place of the stiff leather wallet has, at first sight, much to recommend it. It is roomy, and it is, no doubt, desirable to approximate the equipment of officers to that of the men when the requirements of the two coincide. But in this case the needs of the trooper and those of the officer are very different. The former carries a great portion of his kit in his wallets, and does not require to get at them until the end of the march. An officer carries such small articles as a note-book, a map, a compass, matches, money, a pipe, &c., and requires a wallet which will enable him to get at these articles in the shortest possible time. Now the cloak is directed by regulation to be carried "in front of the wallets"; this cannot be done unless the wallets are stuffed full, and so it results that in practice the cloak has to be carried *on* the wallets, thus preventing any ready access to them. The old pattern wallet, when provided with a cover, met all the requirements of an officer as a handy place to carry what he was constantly in want of.

To make the new pattern of real use, the cloak should be carried behind the saddle, and the following minor alterations made:—

The two wallets are made too near together, which raises them so high on the saddle as to make it impossible to drop the bridle hand. The flaps are too long, and this brings their ends under the wallet straps, and so prevents them being opened without undoing the straps. The bottom of the flaps, when the wallet is empty, should be clear of the wallet straps.

Artillery.

Head-dress.—The head-dress for artiilery requires some modification of that for cavalry; it may be lighter, and should be so made

as not to interfere with the laying of a gun or the use of field-glasses, as the present pattern of helmet does. This might be accomplished by making the back curve upwards slightly at the neck, so as to be free of the neck when the head is thrown back in laying, or perhaps the back-piece might be made detachable and to fasten with buttons, so as to give a certain amount of play at that part.

Since writing the above I have obtained the pattern of a head-dress for field artillery devised by an officer commanding a field battery. It may appear at first sight to be a rather startling innovation on 19th century costume, but I feel confident that it is on the lines of such a head-dress, though with possible alterations of detail, that we must look for any satisfactory solution of the problem of a serviceable and presentable head covering for field artillery and infantry.

This head-dress weighs 1 lb. $\frac{1}{2}$ oz., as compared with the present field artillery and infantry helmet 14 oz., Hawke's Indian pattern with puggaree 14$\frac{1}{2}$ oz., and the German infantry helmet 15 oz. to 1 lb. It might be made, I think, lighter. It is soft and comfortable to wear, the front and rear peaks, whilst affording protection from sun and rain, do not incommode the wearer in any position of the head, and it is, I think, of a decidedly martial appearance. The cost would be, I am assured, not more than that of the present helmet. Some modification of the top appears to me necessary to prevent the rain, snow, &c., from lodging there. A somewhat similar pattern, of say grey Astrachan, would make, I think, a very suitable head-dress for infantry.

The new rifle busby, excellent head-dress though it be, seems in many respects to have a similar defect of collecting rain on the top, and conducting it down the back of the neck.

Coat.—The present pattern blue serge frock for field artillery is very generally disliked, as being "neither useful nor ornamental." "How can a man be expected to take a pride in himself in such a coat?" has been frequently said to me. A Norfolk jacket, as recommended above, would be, I think, more suitable, or something after the pattern of the serge frock issued to the garrison artillery, which is a much more shapely garment than that of the field artillery.

Boots.—The necessity for a boot in which a man can walk with ease is at least as important for the field artillery as for the cavalry. The "Mounted Service" boot, already alluded to, or putties and ammunition boots, appear suitable, though I believe that the traces are apt to wear drivers' putties out. I, myself, prefer a neat gaiter to putties. There is much to be said in favour of the old booted overall and Wellington boot for field artillery. They are still worn by the men of the French and Italian field artillery.

Valise.—The double sheepskin valise issued to cavalry in 1887 has lately been issued also to the artillery, replacing the system of rolling up the kit in a blanket, which has obviously many disadvantages in camp or in a wet or muddy bivouac.

Knapsacks are still, however, used for the gunners of field artillery; why, I don't know, as a gunner can never be required to carry a

knapsack. All the knapsacks in a battery cannot be carried. If valises were substituted for non-mounted men, and were made a little smaller, they could, I understand, be carried attached to the guard-irons of gun and wagon limbers and wagon bodies, and then the space now occupied by the knapsacks at the back of the gun limbers might be utilized for carrying portable magazines full; fixing an iron ledge for them to rest on.

Officers' wallets have been noticed under the head of cavalry, and the same remarks there made apply.

Field-glasses.—The present large shoulder pouches of artillery officers, intended, I believe, to carry field-glasses in, are, I think, a mistake, for they cannot well be made large enough to carry really good glasses; they wear out the lace of a dress jacket, and are uncomfortable to carry at a trot or gallop. The old pattern R.A. pouch answered the purpose for which it was intended, and field-glasses can be best carried on the waist-belt of the "Sam Browne" pattern, or on the off-side of the saddle, as already recommended.

Infantry.

Infantry Head-dress.—The defects of the present pattern infantry helmet are, want of sufficient protection from the sun and rain at the side and back, inconvenience in shooting lying down from the back of the helmet catching the nape of the neck, deficient ventilation, and a tendency to bob up and down on the head when a man doubles. What has been said about a suitable helmet for field artillery applies equally to infantry. The colour should be French grey; leather chin-straps should be used on service and at manœuvres, and brass ornaments should be avoided for the field.

The Glengarry cap, though smart-looking when properly put on, is not a suitable cap for a soldier. It is apt to fall off when a man moves at the double, the ribbons are an annoyance in windy weather, serve as a conductor of wet down the back of a man's neck in rainy weather, and constantly require replacing, at the soldier's expense. A smart and useful cap, something as described for cavalry, is wanted, with regimental piping, and perhaps a smart cockade.

Coat.—The coat should be a Norfolk jacket, as already described; the pockets in the skirt should be strictly reserved for the extra ammunition to be served out to the men on going into action. A useful addition to the service coat would be a pad on the shoulder-straps, to protect the shoulder from the rifle, and to prevent its slipping, as in the Austrian service.

The officer's coat should resemble those of the men in pattern; a frock coat, after the staff pattern, might be issued for undress in place of the blue patrol jacket. There are many who advocate a return to epaulettes. They are certainly a handsome and soldierlike addition, have the advantage of rendering the wearer's rank easily distinguishable, and convert an undress coat at once into a full-dress one. If adopted, some of the present gold lace, which has, I think, a rather tawdry appearance, might be discarded.

The shell jacket should have a roll collar, regimental facings, and shoulder-knots, and should be cut and fitted like the cavalry stable jacket.

The great-coat should be of better and warmer material, and made really waterproof, which the present pattern is not; colour, French grey or light blue, as a dark shade is very conspicuous on a light night; it should have a belt at the back, so as to be gathered in at the waist when required.

A fatigue dress is, I think, very desirable for barrack fatigues, coal carrying, digging, &c. It should be easy, and not liable to be readily stained or discoloured. A blue serge blouse, with loose trousers, would answer the purpose. Such a suit is issued to a recruit on joining, and might well be kept up during a soldier's service.

Boot.—The boot is, of course, an all-important subject to an infantryman. The British army have always proved themselves good marchers when occasion has demanded, and this fact alone goes far to prove that there is nothing very radically wrong with our boots. Yet I have noticed that they have been condemned in no measured terms in our Service press.

I have myself had a long official and personal acquaintance with the ammunition boots, and have gathered opinions on them from all ranks of the Service, and I believe that our boot is the article of the soldier's dress in which we approach the nearest to perfection. I do not mean to say that there are not matters of detail that might be improved on, but, as an all-round, serviceable article of dress, I think that our boot is hard to beat. And this opinion, I may say, is shared generally by officers on the Continent. The Germans, I understand, hope shortly to adopt it.

Much attention has been paid to this subject by our authorities, and some few years ago three or four different patterns of boots were tried at Aldershot, but none of them came up to the present boot, either in fit or wear.

The boots are of two kinds: steel-billed, hob-nailed, and clump-soled for winter use, and one of lighter make for summer wear. The clump-soled boot, though suitable enough for recruits' drill on the barrack square, is not fit for marching. The rigidity of the sole, and the harshness of the leather, cause the instep to swell on a long day's march.

With our small army we cannot afford to lose a single man from the ranks that can be avoided. What is wanted for marching is a steel-billed and heeled boot, with wide, stout soles, studded with spriggs or small nails, made of pliable leather, and with a tongue of soft leather under the lacing to keep out the wet, as in a shooting boot.

They should be made in such a variety of sizes, as regards width and length, as to ensure every man getting a proper fit, a point not sufficiently attended to.

I would recommend the issue of a still lighter boot for "walking out." These might perhaps take the place of the shoe which has

been, I believe, issued experimentally to the troops at Aldershot for use in camp.

Socks.—Bandages are used in the German and Russian armies instead of socks. They must, I imagine, require much practice to put on without creasing. Socks are, it seems to me, preferable for soldiers.

Gaiters.—The present gaiter is too short to protect the trouser from mud splashings in wet weather. The puttie, generally worn in India, is certainly a less objectionable leg covering for an infantryman than for a cavalry soldier, but in any case they are hot, and apt to impede the circulation of the leg; but they are liked by many, are easily stowed away, and might serve as bandages in action. If used, it is an advantage to have them marked, to distinguish those for either leg.

Departmental Services.

The uniform of all the departmental services should be simple and easily recognisable. All such unmeaning resemblance as that which now exists between the dress of officers of the medical staff and that of the Royal Artillery should be avoided. It is no compliment to any branch of the Service to be indistinguishable from another, and it gives rise to endless mistakes and misunderstandings, and creates much friction and even ill feeling.

To be in hot pursuit of what one fondly imagines to be a major of a battery and, after much hard riding, to overtake the medical officer in charge of the ambulances, or be in urgent search of a medical officer to attend a case of sunstroke or injured limb, and to run down a subaltern of artillery, is irritating to both parties and injurious to the interests of the Service. Of all uniforms, perhaps, that of a surgeon should be the most readily recognisable.

Valise Equipment.—The valise equipment is an important branch of our subject; for although it is doubtful if, in an ordinary campaign, our soldiers would carry their own valises, yet the necessity to do so might at any time arise, and the difference between a well-adjusted equipment and a badly-arranged one is great on a long march.

The conditions for a perfect valise equipment are various and difficult to fulfil completely. Some of the most important are:—

1. That the weight be principally borne on the shoulders.
2. That there be no strain or pressure on any of the vital organs.
3. That the several parts ride comfortably without motion or friction even when the soldier moves at the double.
4. That the equipment can be put together before being put on a man's back, so that troops can turn out quickly in case of a surprise, or in the dark.
5. That a man be able himself to take off readily any part of the equipment without disturbing the balance of the remainder.
6. That an arrangement be provided so that a soldier can leave his valise and go into action carying his 150 rounds of ammunition and three days' "iron" rations.

7. That it shall be possible to loosen the waist belt and open the coat on the march in hot weather.

8. That there be ventilation between the valise and the man's back.

9. That all components be simple and durable.

It is evidently not easy to combine all these requirements. I have here several patterns of equipment, all ingenious, all aiming at perfection. For most of them we are indebted to the Volunteers, and I would remark on the great advantage to the Service generally to be derived from the experience of our Volunteers in such matters. They approach the question free from prejudices, and the State reaps, without cost, the fruits of experiments by practical men, unbiased by professional tradition, and untrammelled by red tape.

Our present service equipment is that known as the "Slade-Wallace," officially the "Valise Equipment, 1888." It is a vast improvement on all former patterns. The weight is brought on to the right place on a man's back, and most of the conditions for a good valise equipment are satisfied.

The points that are still defective seem to be :—

1. That the strap of the water-bottle and haversack still confine the chest.

2. That the valise jogs about on a man's back when doubling.

3. That there is no ventilation between the valise and the man's back. This might be easily remedied by fixing small cork or india-rubber studs to the inner cover of the valise.

4. The material of the valise cover is flimsy.

The equipment professes to be essentially a "service" equipment, and hence the weight can be evenly distributed, and the equipment properly balanced only when ammunition is carried in the pouches. Leaden blocks should be issued, representing the weight of "service" ammunition, and should always be carried in the pouches in "marching order."

A brass regimental device on the back of the valise, as in the Guards, should be substituted for the present system of stencilling, which is not ornamental and has to be frequently renewed at the soldier's expense.

The following is a brief description of the characteristic points of the several valise equipments that I have here this afternoon.

The "Simplex."—This has been in use now since 1890 by the London Scottish R.V., and has been adopted by a large number of Volunteer corps.

The valise is carried on the upper part of the man's back, the great coat on the lower part of the back, attached to and supported by the waist-belt, and the mess tin is on the great coat. The arrangement so far is similar to that of our regulation equipment, but it possesses this advantage, that any of the above articles can be readily placed in position and taken off by the man himself.

The locking of the waist-belt has a simple T-headed arrangement for facilitating the fastening and loosening of the belt.

The "*Eclipse*" has been brought out as an improvement, in some

respects, on the "Simplex." In it the valise is carried on the lower part of the back and the great coat on the man's shoulders, the mess tin being between, supported on the valise. There is an ingenious device at the junction of the braces in the centre of the back of a hinged metal frame free to assume any suitable angle whereby the varying strain thrown on the several straps is compensated for, and perfect freedom of movement in the body of the wearer is permitted.

There is also a simple but effective addition to the pouch of the "Eclipse" of two pieces of felt or cloth sewn to the inside upper edge by which ammunition is prevented from falling out when the soldier is running or lying down, but which allows of easy extraction of the cartridges by the fingers.

In the "*Glennie-Woodgate*" equipment the valise, great coat, and mess tin have the same relative arrangement as in the "Eclipse," but the mess tin can be worn on the waist-belt so that a soldier on going into action can take off his valise and great coat, and still have his food and ammunition with him.

In all these equipments the haversack and water bottle are attached to the waist-belt with a view to leaving the chest free, and they all claim to be capable of being worn with a loosened belt and an open coat if desired.

A very ingenious "service" equipment, suitable, with certain adjustments, for cavalry and infantry, has been devised by Lieutenant-Colonel Lovell, late 21st Hussars, of which there is a pattern here, and some photographs. It has been tried, under the orders of Lord Roberts, at several camps of exercise in India, has, I believe, been well reported on, and is to undergo further trial.

The following are some of the advantages claimed for it by the inventor:—

1. That it carries all the weight evenly distributed on the shoulders and hips without chest pressure.

2. That any article or strap can be altered or removed without reference to the others.

3. That it can be loosened on the march without displacing any article or altering the bearings.

4. That if the horse be killed the rider still retains his food, water, and arms.

5. That nothing interferes with the full action of the sword arm or the "firing shoulder."

We have an arrangement here called the "Woodgate sheet valise and ammunition carrier," intended to meet the requirements of the sixth condition that I have mentioned above, viz.: that a soldier should be able to leave his valise for transport in a wagon and go into action with his full ammunition and rations. It consists of a waterproof sheet to serve as a bed, with pockets to hold ammunition and a bag for the kit, which is wrapped up in a sheet, and from which it can be easily withdrawn. The object is an important one, but the extra weight is a consideration.

Bandoliers.—Bandoliers are a handy method of carrying ammunition, but they confine the chest, and are hot to wear. No ammunition

should be carried in the valise, as it cannot be readily got at there in the hurry of going into action. Pouches front and rear, ammunition pockets in coat, and an ammunition compartment in the haversack will carry as much ammunition as can well be supplied.

Haversack.—The haversack is a most useful article. It will carry almost anything. But it should be made of stout waterproof canvas, and be provided with an inner pocket in which to stow away ammunition apart from the ration, &c.

The table, p. 1051, gives a comprehensive view of the weight carried in marching order by the infantry soldier in the principal armies.

There is a report that Germany proposes to effect a considerable reduction in the weight of equipment by the use of aluminium. I do not see how any important diminution can be made by this means. An aluminium water bottle would no doubt be an advantage, but its cost would be prohibitory in our Service.

Intrenching Tools.—I will not detain you by entering into the question as to whether a soldier should or should not carry an intrenching tool on his person. Of the value of intrenchments in modern warfare there can be no doubt. Every improvement in weapons emphasizes the fact; and it is equally clear that the tools to be of any use must be available at the shortest notice. Still I think that the necessity for not overloading our young soldiers is paramount. Carts are useless, as the tools would probably be miles behind when wanted; but mules, I think, solve the difficulty, for mules can go pretty well wherever an infantryman can go, and a much more useful stamp of tool can be carried by a mule than by a soldier.

Still many authorities consider that some form of intrenching tool that can be carried by the soldier is desirable, and much ingenuity has been expended in devising a suitable implement. It seems to me that inventors have mostly gone astray in attempting to attain too much in the way of combination; they aim too much at the *multum in parvo*, forgetting that Clausewitz's great doctrine of the necessity for simplicity in war is as true of the humble intrenching tool as of the "higher" tactics.

Our authorities have recognised this, and the present regulation tool, the "Wallace" spade, which combines a spade with a pick, is to be supplanted by the "Woodgate" implement.

I subjoin a brief description of these intrenching tools.

The "Wallace" Spade.—Weight 2 lbs. 5 oz., extreme length 23 in., length of blade of spade $7\frac{1}{4}$ in., width $5\frac{3}{4}$ in.; the handle forms a pick. It is carried in a frog, that fastens on the waist belt, the handle being secured to the bayonet scabbard by a loop passing over it.

A man cannot be expected to use a pick effectively with a spade in his hand. Personally, I do not believe in combined tools for war.

The "Woodgate" Intrenching Tool.—Pick: weight 2 lbs. 6 oz., extreme length 23 in., length of cross head 12 in. The head forms also an axe. Spade: weight 2 lbs. 1 oz., extreme length $25\frac{1}{2}$ in., length of blade $7\frac{1}{2}$ in., width 6 in.

The dimensions and weights are thus much the same as those of

	Great Britain.	Germany.	Austria-Hungary.	France.	Russia.	Italy.	United States.[2]
	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.
Clothing	12 4	} 37 4 {	13 10	} 40 0 {	15 13	} 39 0 {	13 2
Kit and equipment	21 3		26 3		24 6		12 8
Arms	10 3	12 4½	10 12	10 12	10 12	9 8	9 2
Ammunition (100 rounds)	6 4	9 11	7 14	7 4 (120 rounds)	6 3	6 0 (96 rounds)	8 0 (80 rounds)
Intrenching tool and case	?	2 0	?	?	2 0	?	?
Share of shelter tent	?	?	?	?	2 0	?	2 0
Balance of day's rations and reserve rations, say	3 0[1]	3 0	3 0	3 0	3 0	3 0	5 5
Total	52 14	64 3½	61 7	61 0	64 2	57 8	50 1

[1] No reserve ration is specified for our Service.
[2] The American weights are not authoritative, the information not being procurable from the War Office at Washington.

4 c 2

the present implements, but the attempt to combine the pick and spade in one tool has been abandoned. They are both carried with the handles up the back and the blades below the belt.

This implement is to replace the present "Wallace" spades as those become unserviceable, and will be issued in the proportion of 50 per cent. to the rank and file, exclusive of pioneers and band and drummers.

The "Underwood" Spade for Infantry.—This is a combined implement. Its weight is 2 lbs. 7 oz., length 27 in.; the shaft is a hollow steel tube, intended to form a scabbard for the bayonet, having a solid steel pick welded at one end, and a detachable spade at the other, which latter can be attached to a chest button of the coat when going into action, and is said to be capable of resisting rifle bullets at ranges over 150 yds.

The extra length of handle is an advantage for digging, and it can be used as a rifle rest, but it is rather heavy, and would be inconvenient, I think, for an infantry soldier skirmishing; the steel shaft might also be found unsuitable in frosty weather.

The "Underwood" combined tool for cavalry is an ingenious implement devised to unite the uses of axe, spade, pick, and heel pegs. It has been tried and well reported on abroad and in India, and, except for the inherent defects of all combined tools, appears a useful and serviceable pioneer tool. Its weight complete with leather cases is 4 lbs.

Both the above were exhibited by Major Underwood, the inventor, at a meeting of this Institution on 10th February, 1888.

Shelter Tent.—A shelter tent has never been carried by our troops. I do not say that it ever will be. Still, what other armies do, we must be prepared to do.

All shelter tents are on much the same principle of a division of load; generally, a tent shelters and is carried by three men. That used in the American War was of the simplest possible form, and is thus described by a private soldier of the Northern army:

"A shelter or 'dog tent' is like a bargain, it takes two to make it. Each man is provided with an oblong piece of thick unbleached muslin, about the length of a man, say 6 ft., and two-thirds as wide, or 4 ft., bordered all round with buttons and buttonholes alternately, matching respectively the buttons and buttonholes of his comrade's piece.

"To set it up, cut two crotched stakes, each about 4 ft. long, point them at the uncrotched end, and drive them into the ground about 6 ft. apart; cut a slender pole to lie horizontally from one crotch to the other, button two pieces of muslin together and throw the resulting piece over the pole, drawing out the corners tight and pinning them down to the ground by means of little loops fastened in them. This accommodates two men. For three men, a piece of rope about 4 ft. long is tied to the top of one of the stakes and stretched out in the direction of the ridge pole, the free end being brought down to the ground and pinned there. The third man then buttons his piece of muslin to one slope of the roof, carries the other edge of the piece

out around the tightened rope, and brings it back to the edge of the other slope, to which it is buttoned. This will accommodate three men and their knapsacks." The weight of such a tent is evidently trifling, but the pole, pegs, &c., would usually have to be carried also.

Major Malet, Northumberland Fusiliers, has patented a very serviceable pattern of shelter tent, of which there is an example here. All the parts are interchangeable, and the tent will accommodate four men in a "section of fours." The dimensions of a tent are:—

	ft.	in.
Length.....	7	0
Height.....	3	6
Width	6	6

The weight of half a tent (one load), with share of iron pegs, hammer, and poles, is 6 lbs.; with wooden pegs and mallet, $4\frac{1}{2}$ lbs.

Two, and even four, tents can be pitched together, thus accommodating 16 men with the minimum amount of space on the camping ground.

I think that it would be a good plan to adopt such a tent for our autumn manœuvres. Columns would gain immensely in mobility, and the cost would be soon recovered in the gain on transport expenses.

A Soldier's Expenses.

I should like to take this opportunity to point out that a soldier is put to a considerable outlay yearly in keeping up his clothing. I am one of those who think that a soldier should be fed and clothed by the State, for such is the understanding under which a recruit enlists.

Now an infantry soldier receives three pairs of trousers in two years; even with care these do not last that period, and a man has, on an average, to provide himself with an extra pair yearly, costing him 7*s.* 11*d.* Similarly, he has to get an extra kersey frock, say, once in two years, at a cost of 4*s.* 11*d.* a year. Lastly, to "keep up" his kit costs a man some 15*s.* a year.

Thus, a soldier has to pay 1*l.* 7*s.* 10*d.* a year for extra kit; he has to pay 3*d.* a day, or 4*l.* 11*s.* 3*d.* a year, for groceries, making a total of 5*l.* 19*s.* 1*d.* from his yearly pay of 18*l.* 5*s.* 0*d.*, or nearly a third of his pay. My calculation is for infantry, but I doubt a cavalryman or artilleryman being better off in this respect. In this estimate, no account is taken of such little items as pipeclay, barrack damages, washing and haircutting, &c.

Indian Dress.

The dress of our troops in India has, in common with all other military matters under the auspices of the late Commander-in-Chief, been studied and perfected in a soldier-like and practical manner. It is too large a subject to enter on here. The only suggestions that occur to me are that a rolled Italian collar might be substituted for

the standing collar of the "khaki" service coat, and that some change is desirable in the ammunition boot for native troops. It is a pitiful sight to see a native soldier, often without socks, in a pair of boots generally many sizes too large for him. On the other hand, the native shoe is useless in mud; at a certain grand review in the north of India our foreign friendly critics were amused at the sight of a number of shoes lying on the passing line, dropped by the native soldiers as they went by.

A simple compromise could be effected by native infantry wearing a shoe with a cloth or canvas spat or gaiter. They would thus retain the advantages of a shoe to which they are accustomed, and would gain most of the advantages of a boot.

With reference to India, the principle on which red or yellow is used by a photographer for the exclusion of the sun's rays from his picture might perhaps be adapted for the benefit of the soldier as a lining to his coat and helmet. The idea, at any rate, might be worth experimenting with.

Yeomanry, Militia, and Volunteers.

The dress of our auxiliary forces should approximate as closely as possible to that of the branch of the Regular army to which they belong. This is, I believe, the desire generally of the members of these services themselves. The distinction between the services should be marked by the letters "Y," "M," or "V," on the shoulder straps; gold lace being reserved for the officers and regimental staff of the active army. Great strictness should be exercised in preventing any deviation from the authorized pattern, or the introduction of any unauthorized addition.

Bullet-proof Uniform.

If scepticism in belief is a characteristic of the age, so also, it may be said, is scepticism of unbelief; it is not wise, therefore, to assert that anything is impossible in the 19th century. Still, to believe that any cloth substance can be rendered impenetrable to a bullet that, at short ranges, requires 2 ft. of earth or of oak, and $\frac{3}{8}$-inch of steel plate to stop it, is drawing rather largely on one's stock of credulity.

At any rate, any such substance must have a considerable weight, and the tendency of the present day is to increase the soldier's mobility by decreasing his load; the Germans going so far as to propose discarding the patriotic little hymn book that their soldiers carry, and which contributed indirectly, but without doubt materially, to their victories in 1870.

To lade soldiers with a protective cuirass would be to return to the principle of mediæval armour. James I said of defensive armour that it was "an excellent invention, for it not only protected the wearer, but prevented his hurting anyone else."

Uniform and Plain Clothes.

Before closing my remarks, I would allude briefly to the rather vexed question, should uniform be more generally worn by officers off duty than is the custom in our Service? It has been attempted to be shown that the want of consideration not unfrequently evinced towards the wearers of Her Majesty's uniform is in part the result of the reluctance of officers to appear in their uniform in public when not on duty. It is said, how can the public be expected to treat with respect a uniform the wearing of which is shunned by those who should esteem it a privilege to be entitled to wear it? And it is thus implied that officers are ashamed of their uniform.

Now any one acquainted with the sentiments of the Service will know well that this is not the case. Officers universally honour and respect the Queen's uniform, and I even go so far as to say, although the statement may possibly be stigmatized by certain civilian critics as military cant, that this very feeling of respect for their uniform has something to say to the reluctance of officers to appear constantly in it. It is as though they were unwilling that it should be vulgarized.

No doubt there are other reasons. A British gentleman avoids publicity; his instincts are averse to making himself conspicuous. An English officer never forgets that, though a soldier, he is still a private gentleman. It is a feature peculiar to our army, and one that certainly leads to many anomalies. I remember the astonishment with which our gallant allies in the Crimea used to see our officers rush at the first opportunity into "mufti," often of the most nondescript character. But the French were quick enough to discern that there was a truth at the bottom of this seeming anomaly that went far to redeem it even in their eyes.

For the connection between soldier and officer in our army has something of a feudal character. The soldier obeys and follows his officer, not only because he is his officer, but because he is of the class that he has been accustomed to respect and look up to from his boyhood. The feeling is not, I fear, as general as it used to be, but it exists still as an important moral factor in the relationship between officer and soldier, and is a great help to discipline.

It is easy to say, Why should a soldier wear his uniform constantly and an officer not do so? The two questions are not on the same footing. Discipline could not be maintained amongst a mass of men who are not always and at once distinguishable as soldiers. I may add, moreover, that the class that supplies our recruits is indeed attracted by the very conditions that repel the English gentleman. In comparing our practice with that which obtains on the Continent, we should remember the difference in our national habits as regards recreation. On the Continent, fencing and gymnastics are almost the only substitute for our numerous games, cricket, football, polo, tennis, golf, &c.

The Queen's Regulations "permit the use of plain clothes for purposes of recreation"; but a British officer scarcely ever goes out of barracks,

but for the purpose of recreation in some form or other. I remember that when a General Officer Commanding a large station in India desired to restrict the licence usually accorded to officers in this respect, his orders were practically evaded by officers carrying a racket bat or a hunting whip whenever they left their quarters.

There are also minor points which affect the question, such as the comparative want of comfort in uniform, the greater cost as compared with plain clothes, the extra expenses in travelling required from an officer in uniform, the impropriety of an officer in uniform carrying a parcel, much more an umbrella.

Most of these objections could no doubt be met or modified, or would settle themselves in time. A neat frock coat and cap for infantry officers would, I think, smooth away some of the difficulties as to dress, and, as for the umbrella, well, it is, I suppose, after all, but a matter of custom. The first man who used an umbrella in England, about two centuries ago, was hooted by the street boys, and its use by men was for long considered effeminate and ridiculous, but it has outlived ridicule, and has become a necessary appendage to a 19th century gentleman; and, as regards soldiers, some years ago umbrellas were regularly used by officers in China, a story indeed being told of an officer being placed under arrest for coming on parade without his umbrella.

Personally, I should, in common with, I venture to think, a considerable number of officers, be glad to see uniform more generally worn by officers, but any reform in this direction, to be popular, must be gradual, and be well supported by example.

Colonel GLENNIE: There are a few points in the paper on which I should like to speak, confining myself entirely to infantry equipment. In the first place, Colonel Bengough states that in the "Glennie-Woodgate" equipment the valise, great coat, and mess tin have the same relative arrangement as in the "Eclipse" and the "Simplex." This is not so. The fact is that I never saw these two equipments until this afternoon, and the few little things that may be like the equipment I am interested in, the Glennie-Woodgate, I think, have been copied from ours, instead of ours having been copied from theirs. It does not, however, make much difference, because the whole secret of the carrying of my equipment they have not got. Another remark in which I do not agree with Colonel Bengough is when he says that the Slade-Wallace equipment carries the weight in the right place. I am sorry I do not see Colonel Slade here. The fact is, the whole weight of the Slade-Wallace equipment comes on the place where, when we were schoolboys, we used to say we got "a hit in the wind." That is where the Slade-Wallace equipment hits the soldier. It presses him just in the pit of the stomach, and he cannot wear it without a tight belt. The whole drag of the equipment brings the belt up. We are told the equipment is only suited for service; it must be carried with a lot of ammunition in the pouches, so that for the equipment to be correct you must add more weight for the soldier to carry. I had it in my regiment two years ago, and I think I am justified in pointing out some of its defects. The great coat is a great drag on the belt, and cannot be got rid of. The man who paraded before us just now had no coat on, nor the full kit on. One of the worst points of the equipment is the coat being carried on the waist-belt, which is about the worst place on which it could be carried. The coat and valise in the Glennie-Woodgate equipment are carried on the shoulders, and on the march the soldier can take off the coat and valise, which are carried on one strap, with the greatest ease, by undoing two ends of each strap, and then he has nothing

but a waist-belt and a pair of braces with his ammunition and food on him. With the equipment as so devised there is no upward drag on the belt at all. I quite agree with Colonel Bengough that we are indebted to the Volunteers. I personally am very much indebted to them in this matter—the whole of the 19th Middlesex is equipped with the Glennie-Woodgate equipment. I applied at Aldershot two years ago to have it tried, and tested, but they did not grant my request. It was, however, tried by the 19th Middlesex, and another regiment of Volunteers had their equipment converted from the Slade-Wallace to the Glennie-Woodgate. The men in the 19th Middlesex are very much pleased with it indeed. The great advantage we claim is that there is nothing over the man's chest. The man can march with a loose belt, and with his coat open up to the neck. The haversack is on the belt instead of being half way down the leg, knocking against the thigh. I think the boots are, after all, the most important thing in the soldier's kit, and I quite agree with Colonel Bengough that the ammunition boot is a good boot, but, in my opinion, it is not half good enough; certainly not for the infantry soldier. A man who gets a sore foot is almost as useless as a wounded man. I think there might be great improvement in the boot by putting better leather into it. The leather at present is too stiff. There is no give in it to the man's foot. Better leather would probably mean a more expensive boot, but it would last longer. The infantry boots at Aldershot in about three months are pretty well done for. I know, at any rate, that they wear out the boots in a very short time. Colonel Bengough recommends the Norfolk jacket. I think the present regulation infantry serge is not at all a bad coat; it is very comfortable; it is made of very good stuff; it wears well; but it wants the addition of pockets. They had some pockets in the last pattern, but they are stitched up, and not used. A coat can be made without plaits just as comfortable as with them. If a coat with plaits gets wet, it takes a longer time to dry, and the dust gets in under the plaiting, so that it is much more difficult for a man to keep clean.

Captain O'CALLAGHAN: I will, with your permission, sir, and at the risk of appearing hypercritical, call your attention to one or two points in the lecture. First, we are told that Lieutenant-Colonel Harrison "telegraphed" from Gibraltar to the colonel of his regiment in London in the year 1834. Now, I think, Colonel Harrison would have found it difficult, if not impossible, to telegraph to his colonel at that date. Coming to another paragraph, I find it is not generally known that at Alexandria our troops fought in three ranks, and in the case of the 28th Regiment it was the third rank that faced about and opposed the French to the rear. Then we are told the regiment got for their conduct on that occasion "the distinction of wearing the badge of the Sphinx on the back of the head-dress, as well as on the plate in front." Now that is not so. The regiment got the distinction of wearing the number 28 behind, as well as in front; and it was only when the numbers were discontinued in 1881 that the Sphinx was accepted unwillingly as a substitute for the old "28." We are told a little further on that "the bearskin of the Greys was granted for capturing the colours of the Régiment du Roi at Ramillies." The Greys certainly got the Grenadier cap, but in those days it was not a bearskin—such a thing was not known—it was a cloth embroidered cap, something like an exaggerated bishop's mitre. Then we have farther on, "The white feather, souvenir of Wolfe's Maida, of the Royal Sussex, late 35th Regiment." That is rather inaccurate, because when the battle of Maida was fought, Wolfe had been killed 47 years, so that his connection with that battle was not very direct. As regards the restoration of the numbers of regiments, we are told that it would not do "to disturb the feeling of *esprit de corps* that is growing up daily around our present territorial system." All I can say with regard to that is, that, if the officers of the army have an increasing fondness for the territorial system, they take very odd ways of showing it. Nearly every officer's card that I see has got the number of his regiment; nearly all the dinners are announced according to the number of the regiment; and I do not know any way, short of a breach of discipline, which the officers of the army do not adopt to show their dislike of the present system. I would refer to one other point which strikes me as being something of an inaccuracy. It is stated that in India it is

found that red and yellow glasses are used in photography to exclude the sun's rays from the picture. Now, practically, they do not exclude these rays at all, any more than any other colour. They exclude the *actinic* rays which make the photograph, and those only, and therefore, I think, the passage fails on that point.

Lieut.-Colonel LOVELL: As Colonel Bengough has mentioned my equipment in his lecture, I may be allowed, perhaps, to say a few words, but I will be as brief as possible. I have a couple of men here wearing my equipment. Of course gentlemen will understand that the equipment should fit the man with regard to size, and, unfortunately, I have dropped across two big men to-day, and the equipment is rather small for them, so that it looks perhaps a little skimpy. I want, however, just to point out the advantages of this equipment. It is not ornamental to look at, being of brown leather for "Service" requirements, but it has been tried in India by several regiments (British and Native) by the kindness of Lord Roberts, and, as far as I can gather from reports, has given satisfaction generally, though a few details are taken exception to that appear easily alterable to suit local requirements or taste, and it is apparently more serviceable, more comfortable and more easily carried than most at present in use in that country. In calling your attention to the following suggestions and remarks by the lecturer (with which, I think, most will quite agree), I venture to point out that I think my equipment (with modifications to suit necessities of various climates) meets the greater part of his requirements and contentions, viz., page 1040, "I would have no more white belts," &c; next para., "On all parades for manœuvres," &c., to end of para.; page 1042, "Sword how best carried," &c., down to "20 rounds or more"; page 1043, "Field glasses and revolvers," *re* "Contents of wallets, map, "&c.; page 1047, "Conditions for an equipment," especially Nos. 1, 2, 3, 4, 5, 6, 7. Now I will recommend to your consideration that my equipment is compact. It is of brown leather and neat in appearance. A piece of soap cleans the whole. It can be used for any parade "Order" by removal or addition of its parts, which are all interchangeable and removable. It is suitable to any branch, mounted or dismounted, with additions or deductions. It is easy and suitable to active movement, and impedes no limbs. My sword and carbine are carried on the saddle until the horse dies, when they can be transferred to the man's body, and he still has his hands free for his lance. The shoulder- or breast-straps *are* provided with expense compartments to be used when needed, waist-belt ditto. Field glasses and a revolver are carried on the officer in the most comfortable way, *instantly* available. A haversack (compartmented) *does* carry the maps, &c. Pockets, leather, *do* carry the watch, compass, &c. The great coat and waterproof sheet *are* carried on the saddle until they are obliged to be transferred to the man, where there is a place, as you see, provided for it. For the infantry soldier I would abolish the valise, and carry one change only in a neat, light, small, waterproof "roll," with his coat and waterproof sheet where you see straps provided for it. *Re* "conditions," &c. (under valise equipment). Mine conforms especially to Nos. 1 and 3. My equipment takes on and off, *entire*, like a coat, and can hang on one nail (the canteen being *on* the bottle). Any part can be removed without altering bearing, which conforms to No. 6. No. 7 can be done. The nearest saddler or tinman can replace or repair the whole, which meets No. 9. Referring to defective points named by the lecturer, my water-bottle and haversack do *not* cross the chest; my valise, or roll, does *not* jog about, being fixed; my haversack carries three days' rations; my ammunition-bag carries 140 magazine; my soldier *going into action* carries 180; my ammunition-bag suits *all* arms, either magazine, Martini, or Snider; the soldier does not lose his ammunition on lying down, as is often the case now. With my equipment a man can turn out at night in 25 secs. (if already clothed), as he puts on everything like a coat.

General Sir GEORGE WILLIS: My object in rising is to bring back the discussion to the subject of equipment from that of the very interesting historical criticism that we have had on the subject of the lecture. And the first thing I wish to say is that I do not quite agree with our lecturer with regard to cocked hats. The cocked hat if made properly, is a very good shelter to the head, and, without the feather, at a distance looks very like a helmet, but when you come close to it there is no mistaking, when a fellow rides down to you with an order, wearing a cocked hat,

that he is a Staff officer. I perfectly agree that the white feather ought to be done away with in the field, because to make a beautiful white bull's-eye of a general or Staff officer's head as he rides about in action is an absurdity. But do not do away with your cocked hat: you can have the flaps made a little wide, so as to shelter the sides of your head, and the peaks do so in front and behind, and you can add as much ventilation as you like. As to the red coat, I am a strong advocate for its retention, and more now than ever, because when you consider the distance at which we commence our operations in war, and the long range of our present arms, and the cover that we take whenever we can, if we do away with the red coat, we shall be constantly letting the enemy's troops approach too closely without recognising them, or else we shall be opening fire upon our own outposts and advanced troops in mistake for those of the enemy. I go even further, because I should like to see every arm of the Service dressed in red, except the artillery, and the reason that I except the artillery is that the artillery have no business in action unless they are supported by infantry or cavalry, and therefore we should always know our own artillery in action, because they will be supported by red coats. Then, again, I think that *esprit de corps* has a great deal to do with the Service. Lately we have heard some distinguished officers say that sentiment and *esprit* are all nonsense. I think that *esprit* has got us out of more difficulties in war than probably even our pluck. The fact is our pluck is part of that *esprit*, and the *esprit* keeps up the pluck, and, therefore, we ought to endeavour in all ways to keep up regimental *esprit*. I think that putties are the most useless things to put on an Englishman that you can possibly have. In the first place, the puttie is difficult to put on; it is difficult to keep in place; it is very hot in hot weather, and it gets sodden through in wet weather. For the infantry soldier the improved gaiter is far better than any puttie that can be put on; and for a cavalryman I think a boot, such as shown by the lecturer, or the ordinary boot, made with the lacing in front, is much better. Coming to the infantry soldier's boot, the pattern is a good one. It requires to be made of a little better leather; but what we require is that there should be more sizes, and it should be made to fit the likely form of the man's foot —not the anatomical form—but the foot as it becomes shaped by hard work should be considered. I have often seen boots made of such inconvenient sizes that where, perhaps, 100 pairs of boots had been sent out to troops on service, not more than 40 of them could be used, because, owing to a man's foot being swollen or chafed, he cannot make the boots fit, and, therefore, it is necessary that more attention should be given to the variety of sizes. As to the equipment, it struck me that the rifleman's looked the most serviceable kit that I have seen. I think it was called the Glennie-Woodgate. I have never seen it before, but it appeared to me a good serviceable kit; but there is one thing that is imperative in the army, and that is that whatever kit you put upon the man's back shall be the fighting kit, because I have seen the struggles of the men when their knapsacks and valises have been taken away, and they have had to carry extra rations and ammunition. Therefore whatever equipment you put on the soldier's back—make it as little as you like—but let them stick to it, and keep it on, even if you put only a reserve of ammunition in it. Reserve ammunition may be carried at the bottom of the valise, with a pair of socks, or a pair of camp shoes, and a day or two's extra rations. If you can only put that in his valise, then he has something on his back that he can carry comfortably without chafing him and sagging about, and that will hold the things without dropping them. The last equipment that we saw was, I think, anatomically wrong. The water-tin and bag under the arms will come just where the nerve of the arm and the artery are placed, and the result will be that after a time when a cavalryman gets a little bit tired carrying his sword in his hand, or his bridle, you will get a pressure there which will numb his hand and arm. I think these are points which should be considered, and whatever equipment we adopt for the troops should be the equipment they should always carry in field order, and in which they should go through a campaign.

Lieut.-General J. J. H. GORDON: I offer a few remarks on the dress subject of this interesting lecture by my friend Colonel Bengough. First, with regard to the difficulty, which he thinks confronts us, of getting a universal pattern suitable for the army in all quarters of the globe. I do not see why there should be any

difficulty in this. With the exception of the head covering, the *pattern* of the soldier's dress suitable for home or foreign service anywhere need not vary. He refers to the number of "orders" of dress the soldier should have. I think two are sufficient, one for show, the other for work. That for show, the holiday and full dress, should be as handsome and attractive as possible; the other, the working dress, should be easy, suitable for all the rough work of the soldier, fatigue, manœuvre, and fighting purposes; the one for peace-time, the other for war. Among all classes the principle exists of a holiday dress distinct from a working dress, and I think this is just as compatible with the soldier's profession as with civil life. The requirements of the active service dress of the soldier are those of the sportsman on the moors—ease and freedom to the wearer, favouring exertion, and thereby lessening fatigue. In this respect the main thing is to assimilate the war dress to the sporting dress in its free-and-easy shape and subdued colour. With regard to the colour of the uniform, scarlet is our national colour, associated with our military history, and as such it should be retained for the gala dress. The lecturer "plumps" for red as the fighting dress colour. He gives as one of the requirements of his dress "as little visibility as possible." There I differ from him as to the quality of visibility. For our recent wars abroad we have adopted grey or "khaki" colour, which from use we may now look upon as our national colour for service. Experience has shown that it affords as little visibility as possible with a colour suitable for a campaigning dress. "Khaki" is a Hindustani term, meaning earth colour, of which there are many hues from light grey or fawn to darker shades. With all deference for the sentiment and moral effect of red, I think they should give way to business nowadays, and that the physical effect of the light-grey clad soldier plying his rifle on the enemy would far outweigh the others. Under smokeless powder conditions red will be found a far more conspicuous colour in the future than it has been in the past, and on the battle-field clear of smoke the differentiating of our own men from those of the enemy should be easier than on the old smoke-covered field. There is another very important advantage in the use of grey. A great deal of the active service of our army is in sunny lands, and light grey has been found to be less absorbent of the sun's rays than any other colour excepting white. I observe that the lecturer has a regard for grey, as he recommends a light grey helmet and a grey overcoat, its present dark colour making it too conspicuous on a light night. So also is the red too conspicuous on a bright or even a dull day. As a campaigning dress for infantry a loose grey coat, somewhat of the Norfolk jacket style, and a grey knickerbocker, with prolongation down the leg to the ankle, cut to the shape of the lower leg and made to button, would seem to be the best and most comfortable shape. The "putties," or woollen bandages in place of leggings, which have been referred to, are an importation from India, which came into general use with the army there during the Afghan War. If properly put on over the knickerbocker continuation described by me, they form a comfortable support for the leg, and have advantages over the leather leggings, which are apt to get hard from wet, and out of shape and uncomfortable to wear. They are easily dried and easily carried if not in use. Tied on over the loose trouser leg they are not so successful, but properly put on over a tight trouser leg I think they will be appreciated by all who use them. Colonel Bengough refers to the dress of our troops in India, which has been perfected in a practical manner, but remarks that the foot covering of the native soldier is still far from being so. The native army is now pretty well equipped on this important point. It is all a matter of expense and fitting; good boots suit the native troops. The material of the service dress of the army in India is khaki-coloured cotton. It is durable and cheap, but cotton and linen are unfavourable to the soldier on service. It is non-absorbent of moisture, not very permeable to air, very absorbent of odours, and requires frequent washing. The soldier on service is practically always working, consequently perspiring; the perspiration passes through the non-absorbing cotton material and, evaporating, produces chill. The men may not be able to wash these perspiration-clogged garments. Light grey serge should take the place of cotton for a campaigning dress for the soldier in India and other warm climates such as Egypt. It would be more expensive, but the truest economy is to provide the best material. Woollen stuff has great absorbing powers of moisture, is far more per-

meable to air than cotton stuffs, wards off chills to the wearer, and obviates the bad results of non-washing. Cotton is in every respect decidedly at a disadvantage compared with wool in a campaign, and the soldier clad in light serge would be more comfortable, cool, and healthy on service in a hot climate than in cotton or linen dress.

Major-General P. J. CAMPBELL: I am afraid I shall be at variance with a great many officers when I say that I do not agree with the two dresses (one for service and one for parade); I think one dress is quite enough; and I have also great misgivings as to the value of serge as a material and of the Norfolk jacket as a shape. Serge collects dust and absorbs wet. I think the best material is good broadcloth. One suit of that will go through a campaign. We are only talking of campaigning in temperate countries. The Norfolk jacket looks well only when carefully made and on a man of good figure, and belts and accoutrements rarely sit well over it. I noticed a guardsman and another man "here produced as models," and there was positively little or no difference between the guardsman's tunic and the other man's frock, which I suppose is a model dress, except that the one had buttons behind and the other had not. I see nothing wrong with the tunic as a fighting dress if it is made sufficiently easy, and for swell occasions ornaments can be put on if necessary. Another reason why there should be only one dress for all purposes is that if a soldier has a duplicate of this he is perfectly well off, but if he has two different dresses he must have a duplicate of each, entailing four suits. I think a good broadcloth tunic, and a suit or two of canvas or stout linen for fatigues and rough work would be all that is required.[1]

Lieutenant-Colonel W. T. DOONER: I will only ask your indulgence for a few moments whilst I refer to some points which Colonel Bengough has mentioned in his lecture. He alludes in the first place to a serviceable coat for the men, and mentions that the striving after extreme tightness seems to be at the root of our difficulty. I agree with what Colonel Glennie said, that the present serge coat is not a bad coat; if the regulations are observed it is quite loose enough, and I do not think the plait down the front would be an improvement. A pocket might be put in each side above the waist; that would be all that is necessary. The two pockets at present are below the waist, and they are always kept sewn during peace-time, so that the linings of the pockets shall not get worn out, and that they may be ready for active service if required. With regard to what the lecturer mentioned about recommending the restoration of facings upon the cuffs and collars, he, unknowingly I presume, has done the authorities, or those who are responsible for the dress of our men, a little injustice, because that coat issued in 1891 without facings, which may well be described as a paragon of ugliness, has been abolished. It was only in use for one year, and there was such an outcry against it that I am happy to say it was done away with. It had only a small shoulder-pad with red collar and red cuffs—an ugly garment—and it was happily abolished in April of last year. With reference to the question of the facings on the cuffs, I do not know whether cavalry officers will agree with me that that coat, which we have heard to-day has been approved for cavalry, should have the facings on the cuffs as well as on the collar. It has not at present. I see it has not got the cuff like the infantry coat has. The lecturer has recommended the adoption of the territorial district number. I certainly agree with him. We cannot, I fear, hope to ever now go back to the old numbers. I wish we could, and I daresay everybody in this theatre would wish the same; but we cannot with our organization ever hope to get back to them, because no one can possibly devise an intelligible scheme; and therefore I think his suggestion to use the district numbers would be welcomed by almost all regiments. I know, of course, one or two—perhaps more—2nd battalions in the army which

[1] I should like to have added that there is a great deal to be said in favour of the much-abused buff leather and pipeclay. Buff is stronger than any other leather, lasts almost for ever, and however soiled regains its pristine appearance by the application of pipeclay, which, however objectionable, is certainly cleaner than blacking, or the various pigments used to dress brown leather, and which utterly fail in producing a uniform colour.—P. J. C.

greatly object to give up the number under which they have gained such great distinction, like the 52nd, and 93rd, and a few others; but still I do not see what is to be done; and I think that there would not be much difficulty, as the lecturer has suggested, if the territorial regiments could have the numbers of their districts given to them. Many of the 2nd battalions I think will agree, and I certainly believe it would lead to less confusion, to use the numbers in correspondence, &c. With regard to the actual subject of the lecture, the dress—the service marching order—I think the sooner we recognise that men cannot carry these tremendous weights of from 50 to 60 pounds, and march 15, 18, or 20 miles, and at the end of it, perhaps, fight a battle, the better it will be for us and our army. I think if one would set his mind to devise an order of dress—and it appears to me this goes nearest to it—the Glennie-Woodgate without the valise—for the actual fight or battle—that is what we want. Of course, the men would take their valises on service, but these articles could be left behind perhaps for a day or two, when fighting is expected, until a favourable opportunity occurs of bringing them up; and all the man who is expecting to fight would have to carry would be his ammunition, his three days' "iron" rations, his coat, canteen, water-bottle, and haversack, and perhaps a spade. I know that many times in the 1870 campaign the Germans took off their valises when they got near the field of battle, and this was done in many regiments; but the fact is, they had begun, I think, to be pretty confident about the time they took these liberties. This happened several times at Mars la Tour and Gravelotte, where they felt sure, I think, of victory, that they were gradually surrounding the French, and they did not look for any reverse; but if any reverse ever does happen under such circumstances, I should like to know what would probably be the result! You would be separated from your valises; the men would probably never get them again during the campaign; and I remember well his Royal Highness the Commander-in-Chief, at an inspection at Southsea only last year, mentioning that in the Crimea the knapsacks were left behind on one occasion in his brigade, and they had the greatest difficulty in getting them, and the inconvenience was very great.

General DUNNE: All the knapsacks in the Crimea were left on board ship.

Lieut.-Colonel DOONER: Exactly, and the confusion and trouble that arose owing to it was, I believe, something terrible. We have seen to-day a new blue patrol jacket for officers of cavalry and artillery; if something of the kind were also given to the infantry it would be a great boon to the officers for orderly room and fatigue work. I know many regiments wear these coats, but they are not authorized, I think, in the Queen's or Dress Regulations. But if, in the infantry, there were a blue Norfolk jacket, something like the coat we have seen for orderly room work, or drill parade, and wearing on board ship, it would be a great advantage, because with the red coat, if you are entering crimes, or there is any writing work to be done, it is liable to get splashed with ink, and the coat gets to look anything but neat. A blue coat, like that proposed for cavalry and artillery, I hope, will be given to the infantry also. There is only one other matter I wish to refer to; it is the rolled collar of the mess jacket. I know that formerly many regiments used to have them, but I think that the present regulations of having a regimental collar of reasonable dimensions properly approved of, and the jacket worn looped in front, showing a little of the shirt-front with regimental studs, looks smarter and neater than any rolled collar. I venture to think the rolled collars turned back, as some regiments used to wear them, with a large display of shirt-front, caused officers to look anything but neat and soldierlike when at mess; this rolled collar was not worn, I think, except in some infantry regiments. I never saw them in the cavalry, artillery or engineers.

Lieut.-Colonel C. S. GRAHAM: With reference to *ease* or *tightness* of dress, it seems to me there has always been a misconception regarding "ease" and "slackness," and "tightness" and "smartness," as necessarily interchangeable terms. If you could eliminate *tightness* and *slackness* and get "ease" and "smartness" combined, the soldier would have what he requires. The lecturer has said that "facings would have a real practical value on the battlefield in enabling men of the same regiment readily to recognise each other." Now, the range of colours is limited. I do not know whether he meant that every regiment should have distinctive facings, because that would be almost impossible. There are certain dis-

tinctions of facings at present. Then there is a practical point about a certain facing, which, as an artilleryman, I think may well be urged as an objection, that is when they put a scarlet cuff on the officer's drill jacket. An artillery officer may have (to get off his horse, if mounted) to serve a gun at drill or on service, to show how the duty should be performed; and, really at drill, he would be apt to think twice, if he had a very smart scarlet cuff, as to whether he would run the risk of spoiling it by going off to, for instance, sponge a gun and show a man how to do his work. Then, as regards pipeclay, why they have actually put the blue-coated artillery officer into pipeclayed shoulder- and waist-belts, and at the end of, say, a five days' rainy march, I would like to know what appearance his tunic will present. As to the Wellington boot, it is smart to look at, but for service is open to the same objection as the jack-boot, namely, that it is very difficult to get off when wet, and even more difficult to get on. "The old pattern R.A. pouch, no doubt, answers the purpose for which it was intended." Personally, I am not quite clear for what it was intended. I should like to ask, what is the *practical* objection to the "Sam Browne" sword-belt, of proved utility, taking the place of the present pattern of sword-belt—with its dangling things—for mounted and dismounted sword carriers? As to aluminium, we know that persistent experiments are going on with a view to producing this useful metal abundantly and cheaply. It is extremely light and very strong, and for the metallic fittings, &c., of a soldier's equipment we may look to aluminium, before very long, to lighten his burden. Even for intrenching tools aluminium may come to the fore. Then as to the question of uniform *versus* mufti when off duty. Some years ago, when I was in Germany, I was very much struck by remarks made by civilians with regard to officers. They complained of the overbearing attitude of the German officers towards civilians. May not the fact that they always wear a peculiar dress have tended to foster undue self-importance and self-assertion and a sense that they were of a privileged class? Now the British soldier is a citizen first and a soldier afterwards. The German was a soldier first. I don't know quite where his sense of citizenship, afterwards, came in. The distinguishing feature of the British officer is courtesy and graciousness, and if he always lived in a distinctive dress, and was always walking about in show costume, it might have a bad effect on his social relationship with those who were not of his caste. The instincts of this country, though military, are certainly against "militarism." I believe our officers would lose respect if compelled, by Regulations, to constantly appear in public in military dress, and I do not think the custom would be welcomed by their civilian fellow countrymen.

General MACKESY: I wish to make a remark about the shoes of the Indian troops. The shoe is not supplied as a regulation article of dress by Government, but is arranged for regimentally. As far as the shoe goes, it is the most suitable dress for the Hindustani in the plains of India. Natives are accustomed to it from their boyhood, and can make enormously long marches in it. But the shoe fails on rough rocky ground, such as that beyond the frontier, and of late years Commanding Officers have very generally adopted a modification of the ammunition boot made at the Cawnpore boot factory by Messrs. Cooper, Allen, & Co. Then with regard to the effect of lining helmets with yellow cloth. When I was in charge of the Army Clothing Department, which supplies from Alipur helmets to the British army in India, under the orders of Government, some four years ago this very subject came under discussion, and the experiment was tried of lining the helmets with yellow cotton cloth on the suggestion of a young engineer officer. A proportion of helmets so lined was issued to the troops all over India. After a year the result was ascertained, and the general conclusion was that no benefit whatever had resulted from the adoption of the yellow cloth. It may be that the rays acting on the brain and spinal cord are the obscure heat rays, and not the actinic rays, which no doubt would be stopped by yellow cloth. It is well known that the worst cases of heat apoplexy at stations like Mean Meer and Mooltan occur at night (when actinic rays are absent), while the obscure heat rays radiated from the heated soil are very distressing.

Major-General BARRETT: I wish to offer a very few remarks upon the equipment worn by the infantry soldier; but before doing so I have to note, as a somewhat unfortunate circumstance, that though we have here presented to us several

new and ingeniously contrived samples, yet we have not been favoured with a view of the equipment now in general use, that is to say, the 1882 and 1888 patterns, the 1888 being worn by the Household troops and a few other regiments, and the 1882 by the remainder at home and abroad—marines included. The lecturer has remarked with regard to the 1888 equipment that it has been a vast improvement on all former patterns, that the weight is brought on to the right place on a man's back, and most of the conditions of a good valise equipment are satisfied. I differ from him on these points, for it appears to me that the whole equipment rides without adequate, or indeed any, support from the braces, and the entire weight is thrown upon the front of the waist-belt which is very tightly worn, and the vital organs are consequently liable to severe and dangerous strain and pressure; and as the braces of this equipment fulfil no useful office they are absolutely superfluous and delusive, and could be very well removed altogether without affecting in any way the carriage. So faultily is the 1888 pattern devised, that should the soldier require to open his waist-belt for alteration or rest, he must hold on to it; for, if released from the hand, the whole set would shift position, and its downward course to the ground would be only arrested by the tunic hooks, which *really* support the rolled great coat and canteen, and which prevent the waist belt, to a certain extent, being dragged up to the small ribs. It is very noticeable that the waist belt has that tendency at all times, and that it requires the wearer's constant attention to mitigate its discomfort. The lecturer has suggested that to make this equipment balance, certain weights should be carried in marching order in the pouches, corresponding to the weight of the service ammunition. I do not think well of this proposal, for, to effect satisfactory balance, it would be necessary to carry what would be an otherwise useless load in front to balance that on the back, in fact to double the marching order weight. The suggestion seems to go a long way in condemnation of the equipment, the different parts of which, we have also heard, shift and jog about unpleasantly during any quickened motion of the body during exercise or in stooping, and are not self-balanced so as to retain their positions when worn separately. I would advocate a flap back to the valise in preference to the bag mouth, which makes the packing difficult; and with reference to the pouches I would favour deeper ones, collapsible, and without compartments for single rounds; a couple of these pouches should be worn and be sufficiently large to hold all requisite ammunition without recourse to the haversack or the clothing pockets. The ventilation between the valise and the back would be difficult to provide for where the load is carried high on the shoulders and closely strapped to the supporting point in front of the body, particularly when other parts of the equipment, though separately packed, are attached to the same support. To my mind the valise should be carried just low enough to lie in a balanced position unsupported by other weight (like the 1882 pattern which rides without undue pressure against the wearer, and admits of free circulation of air). I would now but ask the lecturer, who has brought this very important equipment question before us, and who has given it so much thought, to examine well the 1882 pattern; for, though it has one or two minor blemishes, it fulfils all the conditions he has named as necessary or desirable in an infantry equipment, viz., weight borne on the shoulders and well balanced without strain or pressure on any vital organ, no motion or friction even at the double, readily put on or off, or put together without help or disturbance of remaining parts, pouches carrying the requisite ammunition, canteen and haversack so made as to carry ration and food. This is the only equipment in the Service that can be worn without displacement of any of its parts when the waist-belt is unlocked and clothing opened; it has good ventilation between the valise and the back, can be carried high or low to suit the convenience of the wearer by slightly altering the position of the D on the inner side of the valise, it has a minimum of straps, is simple and durable, requires no troublesome fitting, and may be transferred from man to man, irrespective of size, without any previous preparation or any alteration.

Captain WOODGATE: It is stated in the lecture that "the conditions for a perfect valise equipment are various and difficult to fulfil completely." There are nine of them given. I should like to take them in order, and see whether the present equipment fulfils any of them:—(1) "That the weight be principally

borne on the shoulders." General Barrett has just pointed out that the weight is not borne by the shoulders in the service equipment. (2) "That there be no strain or pressure on any of the vital organs." Here also it has been shown that a great deal of strain is borne by the vital organs, as the whole pressure is on the belt which is dragged upwards and inwards. (3) "That the several parts ride comfortably, without motion or friction, even when the soldier moves at the double." Lower down the lecturer states that "the valise jogs about on a man's back when doubling," so that this condition does not hold. (4) "That the equipment can be put together before being put on a man's back, so that troops can turn out quickly in case of a surprise, or in the dark." That certainly is a condition it does fulfil. (5) "That a man be able himself to take off readily any part of the equipment without disturbing the balance of the remainder." Colonel Glennie has already pointed out that a man cannot possibly take off his coat without first removing the whole of his equipment. (6) "That an arrangement be provided so that a soldier can leave his valise and go into action carrying his 150 rounds of ammunition, and three days' 'iron' rations." This is not provided for in the present service equipment. (7) "That it should be possible to loosen the waist-belt and open the coat on the march in hot weather." That certainly is totally impossible at present, because, if you open the belt, there are only the shoulder-straps to take the strain of the equipment which, under normal conditions, is entirely on the belt. (8) "That there be ventilation between the valise and the man's back." The lecturer says that is not so with the present equipment, and I do not think it is so with any equipment. (9) "That all components be simple and durable." Except the valise, which the lecturer says is flimsy, this would hold. So that out of nine conditions that are necessary for equipment it seems the service equipment fulfils one of them, and partly another one. I do not say that the Glennie-Woodgate, or any other equipment, is perfect. What I do say is that I should like to see all the equipments tried openly and fairly against each other, and let the one best suited to all conditions be adopted. Whenever I have been to the War Office, I have been treated with the greatest courtesy. The authorities are very ready to see me, and talk to me on any invention I may bring before them, but, curiously enough, they won't have anything to say to equipment. I do not know whether it is according to the old saying, that when you have married a wife you must make the best of her, and that, therefore, having taken an equipment, they must stick to it; but I know that on the point of equipment the War Office will not have any dealings with me or any other inventor. One regiment of Volunteers that had taken the Slade-Wallace equipment, on a recommendation from the Horse Guards, found that when a full marching order parade was ordered, only about six men turned up. The thing came to such a pitch that the Commanding Officer had to call a committee to consider the question. The conclusion arrived at was that either full marching order must be abolished or that the equipment must be altered. They decided to alter the equipment, and it so happened that they converted it into the Glennie-Woodgate, so that we have one great advantage, that we are able to convert the service equipment into our equipment, and it was done at a very small cost, I think something like 3*s*. a head. That regiment now has the Glennie-Woodgate equipment, and can have full parades in full marching order. With regard to the pouch at present in use in the Service, that has been surpassed, according to the opinion of the inventors of the Slade-Wallace equipment, and they have adopted and used the Lintot pouch, which, in my humble opinion, is a very good one indeed. It has the facility that you can fill it with the greatest ease, and you can turn it upside down without any of the ammunition falling out. It is not made in compartments, but is simply a bag made very much on the same principle as sporting pouches. With regard to the intrenching tool, the lecturer has mentioned that the Woodgate intrenching tool is to replace the present Wallace spade. That is perfectly true. After four years of experiments, the Government have decided that my intrenching tool is superior, and they are going to introduce it into the Service when they have used up the present sets of tools. But the question that is here presented is, if my tools are superior to the ones at present in the Service, why have an inferior article? Why not adopt them at once, instead of waiting until the present tools are used up? Tools are not used up like loaves of bread,

in any great hurry. It would take, I should say, at least seven or eight years before they would use up the tools they have in the Service, and during that time the soldier is equipped with a weapon which has been decided to be of an inferior class. Of course I am met with the query, "What are we to do with the old ones?" What did we do with the old valises? What did we do with the old equipment? There are still the Militia and Volunteers, both of whom would be very glad to have the intrenching tools, and, if they are to be equipped at all, they may as well be thoroughly equipped, not only with the valise and other things, but also with an intrenching tool, which is as important as the valise. What has been said before leaves very little for me to add, except, as I mentioned before, that I should like to see the whole matter fought fairly out at Aldershot and elsewhere.

Major-General MOODY: Much of what I proposed to say on the defects of the Slade-Wallace equipment has been anticipated by the last two speakers. Why it was ever adopted I cannot understand, as I have never heard an officer say a good word for it, and yet, with all its defects, it still is retained. Last autumn I had to superintend the fitting of some 1,500 sets which were supplied to the Portsmouth Division of Royal Marines. A more difficult and unsatisfactory job I never had before. No sooner was the fitting done and the men had a march or guard duty, than it had all to be done over and over again, thus worrying both officers and men. To my mind the 1882 equipment with some slight alterations was a much superior one. You could get the kit better stowed, it was more easily carried, and less complicated. As an experiment I sent three men with a field column which was out 10 days. One of them carried the 1882 equipment slightly modified, another the 1888 (Slade-Wallace), and the third another equipment. I gave directions that they should exchange equipments, so that they could judge which was best from a soldier's point of view. They agreed that the old equipment was the best in every way. The alteration made in the old braces was the invention of a corporal in the shoemakers' shop, named Penelhun, and it could be carried out for 1*s.* 4*d.* a set. I may say that I expressed to the men no preference for either set of equipment, and I did not understand at the time that it was intended that the Royal Marines should be supplied with the Slade-Wallace. I consider that a fatigue dress is most important for the army. The Royal Marines have had a duck tunic and trousers and a serge tunic as fatigue dresses for many years, and both on shore and afloat they are found invaluable. For general purposes the serge tunic and old cloth trousers might be sufficient. Such a dress would do for coal carrying and other dirty work, which has now to be done in a red coat. It should be allowed to be taken on furlough, so that a man might wear it about his home, and so save his swagger uniform for walking out.

The CHAIRMAN: It only remains for me to make a few brief remarks on the subject of the lecture. There having been a large number of speakers, I have been anticipated on many points, but the lecture ranges over such a large variety of subjects, and so many branches of those subjects, that it would take a long time and a great deal of discussion to adequately deal with the points which have been brought before us by Colonel Bengough. There are some things which we have to remember in dealing with the subject. In the first place, considering that a great part of the attention of officers and soldiers has for many years been devoted to this very subject, it would appear surprising perhaps that we have never yet come to any decision. That alone is sufficient to show how extremely difficult and complicated a subject it really is. It is not really so simple as might be supposed to decide on a perfect dress for the soldier. If it had been simple, you may depend upon it we should have come to the point a long time ago. There is one thing we ought not to lose sight of, and that is "simplicity," because you will always find that men who have had a great deal of practical experience are anxious to go back to the simplest thing. The most ingenious inventions are generally made by persons who have had great experience in manufacture, but who have not always had great practical experience in dealing with men, and, I am sure, to have a great number of straps and dodges, as you might say, about the soldier does not conduce to his comfort in the field, although it might be more comfortable for the moment when he was marching side by side with another man for an hour. You have to deal with the multifarious conditions under which a soldier finds himself on service, and what he does want is

that his equipment shall be simple, even if it is not quite so easy for the moment as some other pattern might be. He is under conditions of undergoing a great deal of fatigue, a great deal of harassing work, and he wants rest, which often gets disturbed, and he wants to be able to take off his equipment and to put it on again easily. I was very much struck by some remarks made with regard to the question of epaulettes. I think the lecturer told us that epaulettes were a good thing. I entered the army when epaulettes were worn. I landed in the Crimea wearing them, and the whole of the officers were wearing them. I can only say they are the most dreadful things you can imagine for any soldier to campaign in. When you are wearing epaulettes you cannot lie any way except upon your back. I may say the old epaulette was the worst thing an officer could have for active service. Even the epaulettes that the soldiers had were most disagreeable. That which is a beautiful dress for Court dress, a review, or so forth, is not always good for a soldier's life. As for the helmet, in our desire to imitate the Germans, who have taken such a decided lead among the military nations of Europe, we have adopted the helmet almost universally; but our helmet is not the helmet the Germans have for use, that is to say, our helmet looks very nice, but we sacrifice everything to appearance. The helmets that we have here look very fine indeed, but, as we all know, an infantry soldier cannot shoot with our helmet, and an artilleryman cannot lay his gun with our helmet. The helmet that we have may look more graceful than the German helmet, but it is not so useful. I think if we went more into the practical use, and discarded ruthlessly anything, however handsome, which was not practical, we should arrive at a better solution on this point. I quite agree with the lecturer as to the desirability of having distinction in uniform, and also of having facings in order to distinguish the different corps. It is very true, as was said just now, that you cannot have separate coloured facings for every regiment, but you can have separate coloured facings for regiments of every class, and that used to be the case in the army in the days when I entered it. In those days, if you saw a highlander with a yellow facing you knew that he belonged to the 93rd; if you saw a fusilier with another facing, you knew what he was. And there used to be also light infantry regiments, and you could tell at once by the facings, combined with the tartan, or wing, and so forth, what the regiment was. I can only say that, thrown as I was in the Crimea, a very young officer, with a very large number of regiments, I could tell almost every regiment by sight, and directly I saw a man I knew what regiment he belonged to. It is a great mistake to attempt, as has been done of late years, to assimilate distinctions which used to be peculiar to certain corps. For instance, it was a mark of the Artillery and the Engineers to have the broad red stripe for the private soldier. Now when you see a red stripe, you never know who it is. It was very important when you saw a man wearing his great coat to be able to tell to what branch of the Service he belonged, and you could do it by the red stripe on the trousers. With regard to the amount of kit to be carried, there is a very great objection to a soldier separating from his kit. Of course, on an emergency it must be done. If soldiers have to perform a difficult duty on service, most Commanding Officers and General Officers would, if they felt it was an important point, risk losing the kit, because they would say, "I must get as much as I can out of my men at this moment." But, as a general rule, with a large army, you cannot leave your kits about everywhere. When our men landed in the Crimea, it is perfectly true that they left their knapsacks behind. I remember a General Order being issued that the men were to take a pair of boots, a pair of socks, and something else, and roll them up in their blanket, and carry them that way. That was an order issued by a very experienced General, a man brought up in war, with the traditions of a great war, and it was the only way of carrying those articles; but I do not think it was a satisfactory way, because, for a man to unroll his blanket and have his boots, &c., tumbling about in the mud is not satisfactory. I am an advocate for an extremely small kit on active service. You have your general reserve, and if men want new boots or shirts they can be supplied from the reserve at a convenient opportunity, but a man is not supposed to carry a year's supply about on his shoulders. That is a very important thing. However, I agree with what was said, that you should have a small bag if necessary. If you have to carry small things you should be able to put them in a bag, and roll

it up in your blanket, but do not have them loose. I think it is hardly necessary for me to indulge in a very long speech on these matters, because they are quite as familiar to you as they are to myself, and the more so, perhaps, as there are many of you who have been more recently dealing with soldiers regimentally. I think we are very much indebted to Colonel Bengough for bringing the subject forward. It is one of those subjects of detail which are not always interesting to spend much time over, but which are of the very greatest importance, because, as the army must consist of details of men, so the details which affect those men become of the greatest importance. We are dealing with the whole army as a weapon, and it is of very great importance that we should have our soldiers perfectly equipped. The question of colour is a point which has been very much mooted, and is of very great interest in our army. We know that most other armies adopt a shade of blue, but no one can doubt that the traditional colour of our army is one which is very much held to by officers and soldiers, and also by the nation generally. Therefore, one would not lightly part with it. I do not see myself that there is any necessity to part with it. In the first place, it depends on the circumstance how much red is distinguishable. I have myself seen a battalion of Frenchmen at a distance, too far off to distinguish what they were, and there was just as much red visible about them as about an English regiment, on account of their red breeches, especially when they turned the corners of their coats back, as they very often do in marching. There is such a mass of red that they are far more conspicuous than was the English regiment in the old days. I admit that the English soldier is more conspicuous now than he used to be. In the old days of the coatee there was not the mass of red that there is with the tunic. The coatee had bars of white right across the breast which concealed part of the red, and then there was the belt and the haversack, so that there was very little red visible at all, and the red infantry of the old day was not very visible at a distance. A Turkish battalion coming downhill, wearing the red fez, was more conspicuous than an English regiment, the red fezes one above the other making a mass of red. We have settled the point, as regards active service, by the absolutely universal practice that we have now introduced, that whenever we go campaigning in a moderately warm country we wear khaki. I have seen the Life Guards in helmets and coats of this sort, no metal helmets, and no cuirasses. You would not have taken them for Life Guards: they might have been any cavalry. And the same applies to the Foot Guards and other corps, so that we appear, by universal consent, to have adopted for active service the khaki colour, discarding the red for the time being. I am not insensible to the value of red, and those who have read Sir William Napier's "History of the Peninsular War" will remember that at the time of the passage of the Pyrenees, when the French were very much demoralized, the advance of a red regiment was enough to cause them to be ready to give way. On one occasion, however, when the Rifle Brigade, the old 95th, who were dressed in rifle uniform, were ordered to attack a position, the French, thinking they were Portuguese, resisted so stoutly that they caused a very heavy loss to the Rifle Brigade. It was solely owing to the fact that they thought they were Portuguese by their uniform. That, of course, is an illustration of the moral effect produced by a succession of victories. We all know that it has been desired that the whole of our forces, Volunteers as well as Regulars, should be dressed in red, so that in case of invasion the enemy should not be able to distinguish between the different branches of the forces. Not that we do not suppose that the Volunteer forces would act as well as Regulars, but for the same reason that the Rifle Brigade were so badly treated in the Pyrenees, namely, that we do not wish that any part of the line should be picked out as one which the enemy would try and devote the most of their efforts to break. I mention that to show that there are considerations both ways. I will now, on your behalf, thank Colonel Bengough for his kindness in having come to lecture to us to-day.

Wednesday, June 7, 1893.

REAR-ADMIRAL EDMUND J. CHURCH in the Chair.

COAL CONSUMPTION OF SHIPS-OF-WAR.

By W. H. RILEY, Esq., R.N., Staff Engineer.

THE subject of this paper is, no doubt, of special interest to a large number of the members of the Royal United Service Institution and to naval officers generally, and also, judging from several published criticisms, would appear to have some attraction outside the Royal Navy. Under these circumstances it may not be out of place, and not without some value, to offer some remarks for discussion in this Institution on actual expenditures of coal and circumstances connected with its economy.

In the first place, a brief review will be made of the nature of the services performed by a man-of-war for which coal is consumed, and its effect on the accuracy of measuring those services and the amount of coal expended for their performance.

It is a matter of common knowledge that these services are of a much more varied and irregular character than those performed by merchant steamers. A large 1st class battle-ship, capable of developing a maximum I.H.P. of about 13,000 and a speed of 18 knots, actually on peace duty develops I.H.P.'s which vary from 9,000 to less than 900, and speeds from $16\frac{1}{2}$ knots to 6 knots. When a definite passage is made, it is often at a varied speed, and, if steaming in company with other vessels, it is necessary for all but the leading ship to continually vary the revolutions in order to keep station, these variations often taking place several times in an hour. The helm also is brought into frequent requisition, affecting speed, revolutions, and I.H.P. The continuity of a passage is also often further interrupted by evolutionary exercises, during which the variation of speed and course is so great that it is impossible to measure the propelling performance.

Besides propulsion there are also several auxiliary services to be performed, comprising distillation from sea water for drinking and washing purposes, and for making good losses of boiler feed; lighting the ship internally by electricity; pumping water from sea for sanitary and cleaning purposes, from double bottoms, bilges, and drain receptacles; ventilating and steering ship; compressing air for torpedo work; working guns by hydraulic power; hoisting purposes

and driving capstans, all of which, besides forming a varied series, are each in themselves of a more or less irregular character.

As regards propulsion, the variation described renders it extremely difficult to accurately calculate the average power developed. When the revolutions are subject to such frequent alteration, the indicator diagrams will often be taken either when the revolutions are greater or less than the average for the period the diagrams cover; and it is frequently the case that in the interval between taking the diagrams from successive cylinders the revolutions will be changed, thus giving not only unfair but inconsistent results. The principal sources of accurate data are the comparatively rare occasions when the vessels happen to be steaming independently over long distances. It must be borne in mind, however, that the results so obtained may differ considerably from the results obtained when making a passage under the varied conditions noted previously, although in the two cases the average speed of passage may be the same. When steaming irregularly a very rough approximation to the I.H.P. can be obtained by calculating the average revolutions per minute, and taking the I.H.P. corresponding to this as determined on the measured mile trials; this, however, is open to the objection that nothing is allowed for differences in the state of the weather and the ship's bottom, which circumstances are found to have a considerable effect, the exact amount of which is difficult to determine. In some few cases, the conditions as to weather and bottom may approximate to those under which the measured mile trials were made, when fairly reliable results as to average I.H.P. may be obtained in this way.

The amount of work done by the auxiliary engines and appliances is generally impossible to absolutely measure. Some of these engines are fitted with means for taking indicator diagrams, and so enable the I.H.P. developed at a given time to be calculated; but their work is generally of such an intermittent and varied character that this would afford no measure of the average I.H.P. developed. A very fair estimate of the services rendered by the electric lighting engines and the distillers can, however, be otherwise determined, the current generated by the former being measurable by electrical appliances, and the water made by the latter by the capacity of the tanks into which the fresh water for drinking and washing purposes is delivered. The other services are of such a character that they can only be valued by the amount of coal they require to perform their usual daily work.

A few remarks will now be made upon the degree of accuracy with which the coal consumed can be measured and apportioned to the several services for which it is used. The ordinary method of measuring the coal taken out of the bunkers is to fill buckets of known capacity and to record or "tally" each as it passes from the bunkers into the stokehold; one of these is occasionally weighed, both empty and when filled level with the top with coal, the difference giving the weight of coal per bucket. Of course this system of measuring in detail is open to several sources of error, such as when the buckets are not all filled to the same height as those which have

been weighed, or when every bucket is not recorded; and also any inaccuracy in the weighing machine, or from clumsiness in carrying out the operation, will be multiplied when the weight so obtained is taken as the standard for several. It is customary, in some ships, to allow a small percentage on the expenditure so obtained, to avoid a greater quantity being used than is recorded; it is, however, often found that this percentage need only be very minute when the staff has been well trained in coal tallying, and is made to understand the importance of accuracy.

As a check on this method it is the common practice to measure the capacity of the coal in the bunkers; this being an especially accurate method when steaming sufficiently long to have completely emptied one or more bunkers after having been filled. Of course, for this to be accurate, it is necessary that when the coal is taken on board, the bunkers should be evenly trimmed up to the deck beams; this practice, having also the advantage of taking on board the greatest quantity of coal, justifies the extra time taken during coaling to ensure it being done.

It has been suggested that the draught of water of the ship affords an accurate means of measuring coal expenditure; no doubt this would be so if care and trouble were taken to measure the quantity consumed of other stores, and if the ship were floating in absolutely smooth water when reading the draught. The practice is frequently adopted at Government coaling depôts, the coaling lighters used there being filled in places where the water is generally smooth and the calculations not confused by the weight of any other stores. The method is hardly necessary in ships, as the two first alluded to should be sufficient to ensure a fair degree of accuracy.

It is an important point to apportion the amount of coal used to the several services, and in some cases it requires a considerable amount of patience and trouble to attain this end. The advantage obtained, however, is worth the trouble, as in cases of high expenditure it enables the cause to be better traced.

Several ships, including all the more recent, have either an auxiliary boiler or one or more of the main boilers specially fitted for the purpose, which can be connected up only to the usual main lead of auxiliary steam pipe which supplies steam to all the auxiliary machinery. Thus the main and auxiliary machinery, although working concurrently, can be worked independently, and the coal expended for each readily determined. The amount required for each auxiliary service presents greater complications, but can be approximately obtained by having only one at a time in operation for a sufficient period to enable the coal used to be properly measured. These individual results added together will give a greater total than is obtained when all the auxiliary engines are in actual operation together, as the coal required to make good the losses by radiation from the boiler and steam pipes will have been added together several times in the former case, but should only be taken account of once. It can be practically determined from the above data, and can be further checked, if an opportunity occurs, by

stopping all the engines and noting the coal required to maintain the working pressure in the boiler and steam pipes.

When no auxiliary boiler or main boiler specially fitted for separately supplying the auxiliary services is fitted, the coal required for most purposes can be determined when in harbour, and, by subtracting an estimate formed on this basis from the total expenditure when under way, that for the main engines is obtained.

Another method is to note the difference in the daily expenditure under way at low speeds (1) when a particular auxiliary engine is at work, (2) when it is stopped, all the other circumstances being as nearly as possible the same in the two cases. As, however, the disproportion between the total daily expenditure and that for one auxiliary engine is considerable, the trials should be repeated three or four times to obtain reliable results. That this system can be fairly accurate is proved by the fact that separate similar ships have obtained in this way approximately the same expenditures. A modification of this method is to note the difference between the I.H.P. developed in cases (1) and (2) when the daily expenditure of coal is the same. Knowing this difference and the coal expenditure per I.H.P., an approximate measure of the coal required by the auxiliary engine in question may be obtained. Special care must be taken in the measurement of the I.H.P., and the trials should be repeated three or four times.

By adopting one or the other or all of the above plans, vessels can approximate very closely to the expenditure for the main engines and to that for the auxiliary engines as a whole or in detail.

Besides the above expenditures there are also some others which it is necessary to distinguish from them to avoid confusing comparisons, and which are, therefore, separately accounted for. They include laying fires and raising steam, banking fires, waiting orders, and steaming when the speed is so variable that no distance can be logged, as when at target practice; there is not much difficulty, however, in measuring the coal so used with fair accuracy.

Some instances of coal expenditure by war-ships under certain circumstances were given by Admiral Long in his paper on Cruisers, read in the early part of this year at the Institution of Naval Architects. The following is one of a different character, showing a six months' expenditure incurred by a large modern battle-ship on ordinary peace service:—

	Tons.
Steaming, making good distance	869
Laying fires, banking fires, steaming when no distance is logged, &c.	335
Culinary purposes and warming ship	112
Distilling for ship and boilers	481
Electric lighting	554
Other auxiliary purposes, as steering, pumping, working guns and torpedoes, ventilating, workshops, &c.	211

These services comprise four short passages of about 70 knots each

and one of about 500 knots at moderately steady revolutions per minute; one passage of 500 knots at revolutions varying from 61 to 97 per minute, this including quarterly passage trials; 14 days' cruising at from 4 to 12 knots over 2,000 knots, with occasional stoppages; three occasions specially under way for target practice; one electric light engine in use constantly throughout the whole period, generating a current of from 260 to 410 ampères; a second electric light engine in use occasionally a few hours at a time; 1,950 tons of water distilled for ship purposes; and the usual ventilating, pumping, and other minor auxiliary machinery in daily use.

During war service the expenditure would probably be much increased, but would entirely depend on the service required. If called upon to steam long at high rates of speed, the increase would be very great, and coaling would have frequently to be resorted to. It would also be increased, but not nearly to the same extent, if called upon to steam for long periods at a low speed; as this is a very probable demand that will be made, the question is considered in some detail later on.

We now proceed to an analysis of the several services in greater detail, and begin with the main engines, whose object is the propulsion of the ship. The coal expended and power developed by these engines have been determined, in most ships, from definite experiments for the purpose, as well as from the ordinary occasions on which a steady speed has been maintained. The performance in a particular case may be given, that of a large battle-ship, as very full and reliable data have been obtained under definite conditions, and the engines are representative of a large number of recent construction. The following are the expenditures of coal per hour per I.H.P.:—

Percentage of full designed power.	Coal per I.H.P.
55	2·03 lbs.
28	1·82 „
22	1·93 „
14	1·76 „
7	2·2 „

There have been more economical results than these, at some of the powers, from engines of the same type, and also some worse, the expenditure being materially affected by several circumstances such as quality of coal, differences in details of construction, and differences in management. The above figures, however, may be taken as a fair performance under good conditions.

The engines of the ship in question are of the tri-compound type, which, in the Royal Navy, is the most advanced type of engine. Its principal characteristic is economy of fuel, and its adoption has been found to have reduced coal expenditure for power both at high and low powers to about an average of 20 per cent. below that required by bi-compound engines, and about 50 per cent. less than that required by simple engines.

The advance of the boilers with regard to the economical generation

of steam has not kept pace with the engines in the economical use of steam; their advance has, however, been very marked in enabling the high pressures required by the later engines to be safely obtained. The old, roomy, rectangular, low pressure boiler of 30 lbs. per sq. in. enabled a large proportion of heating surface to be introduced, facilitating the passage of heat from the fire to the water, and also large furnaces and combustion chambers which allowed the fuel to burn completely and give out a large proportion of the heat it was capable of generating. The cylindrical forms necessitated by high pressures, now up to 155 lbs. per sq. in., curtailed to some extent these constructive features, and hence there was some falling off in the amount of water evaporated by a given quantity of fuel. It has, however, been found possible, in some of these boilers, to get a high degree of economy. At moderate powers, rough measurements made on board H.M.S. "Thunderer" showed an evaporation of 9·6 lbs. of water per pound of fuel burnt, which was very good Welsh coal. There is no doubt, however, that such a result requires both very good coal and careful stoking. The temperature of the feed water was about 100° F., and the boiler pressure 110 lbs.

To obtain the best results from the steam, it is necessary that the cylinders should be steam jacketed. Steam jackets are not only of value in this respect to the tri-compound engine, but also to the bi-compound and simple engines when even a moderate rate of expansion takes place in each cylinder. The fitting is generally adopted in the navy, and consists of an annular chamber, enveloping the cylinder into which steam is admitted and maintained at a pressure about equal to the maximum acting inside the cylinder itself. This, by imparting heat to the expanding steam, aids in reducing the amount of steam liquefied. The benefit derived from these fittings depends upon circumstances, but it has been clearly shown that the amount of power developed by a given expenditure of fuel can be increased 10 per cent. by their use. In practice, the pressure in the steam jackets must not be so high as to avoid all liquefaction on the cylinder surfaces, as these surfaces, when working too dry, require a larger amount of oil to keep them efficiently lubricated. The objection to this is that a considerable quantity of the oil so used passes with the working steam into the feed water, and thence to the boilers, and increases the temperature of the heating surfaces. With this limitation, however, steam jacketing has proved of economical value.

A very important point, peculiar to the engines of a war-ship, is economical working at reduced speeds, and this point will be dealt with somewhat fully. The previously mentioned battle-ship averaged, on the runs made during six months, a speed of 8·6 knots, which is above the average of most other vessels. This speed corresponds to an I.H.P. of 1,300, smooth water and clean bottom; the actual average I.H.P. would be greater than this on general service. The "ordinary speed" of such a vessel is 9½ knots, corresponding to 1,800 I.H.P., and the most economical speed would probably be near 7 knots, 900 I.H.P.

FIG. 1. _ DIAGRAM SHOWING MOST ECONOMICAL SPEED.

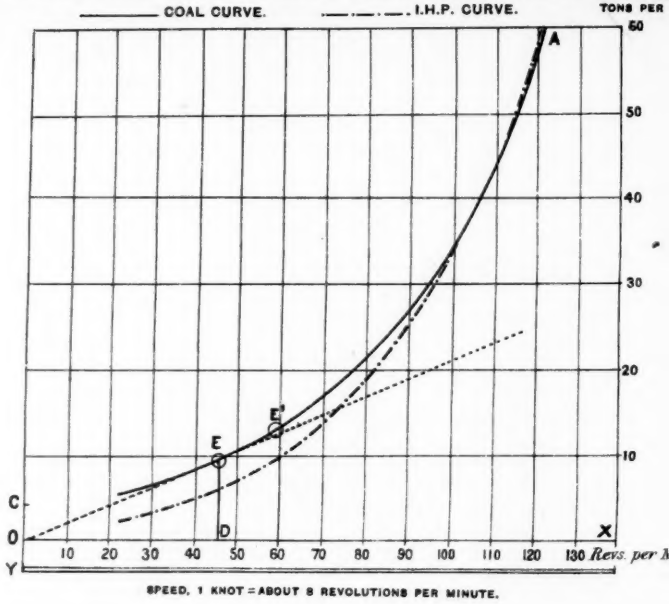
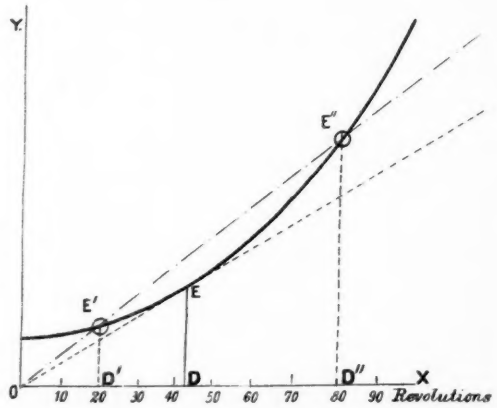


FIG. 4. TO ILLUSTRATE MR. WINGFIELD'S REMARKS.



EXPENDED,
PER DAY.
60
50
40
30
20
10
per Min.

ABSOLUTE PRESSURES,
LBS. PER SQ. INCH.

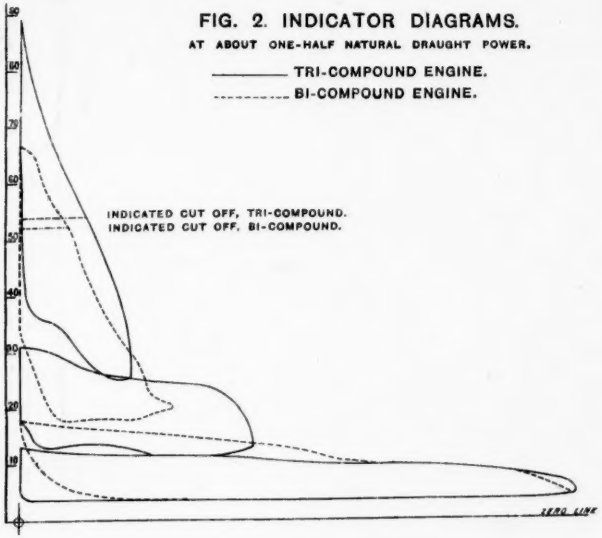


FIG. 2. INDICATOR DIAGRAMS.

AT ABOUT ONE-HALF NATURAL DRAUGHT POWER.

———— TRI-COMPOUND ENGINE.

- - - - - - - - BI-COMPOUND ENGINE.

ABSOLUTE PRESSURES,
LBS. PER SQ. INCH.

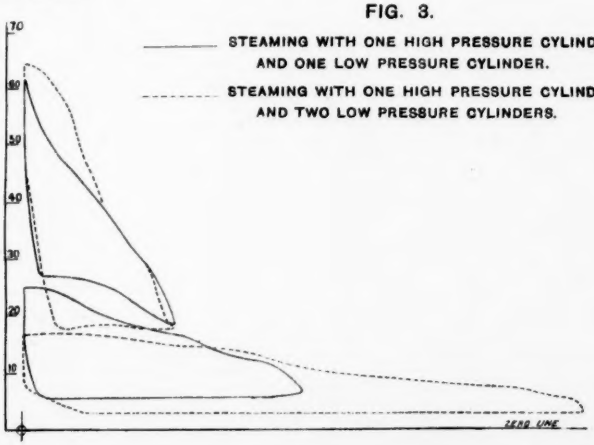


FIG. 3.

———— STEAMING WITH ONE HIGH PRESSURE CYLINDER AND ONE LOW PRESSURE CYLINDER.

- - - - - - - - STEAMING WITH ONE HIGH PRESSURE CYLINDER AND TWO LOW PRESSURE CYLINDERS.

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The low average speed is partly the consequence of the greater distance made good per ton of coal at low speeds than at high speeds, and partly because the nature of the general service does not demand a high speed. The cause of the increased economy for distance at low speeds is, no doubt, well understood, and all that need be done here is to draw attention to some of the sea speeds and consumptions determined at sea in the battle-ship in question, and which are as follows:—

I.H.P.	Speed.	Revolutions per minute.	Coal per day.	Knots per ton of coal.
			tons.	
7,220	13·66	83·6	157·5	2·08
3,600	10·9	68·1	70·4	3·7
2,870	9·92	62·0	59·6	4·0
1,810	8·96	54·2	34·3	6·2
900	6·77	41·2	21·6	7·5

The knots made good per ton of coal show the superiority of the lower speeds in economy of fuel, this arising from the high rate at which the power increases in comparison with the increase of speed.

An important point in connection with this question is that if the speed be reduced below a certain point the distance covered by the expenditure of a ton of coal decreases. The speed at which this change takes place is termed the "most economical speed," and is of service when the chief consideration is to steam the greatest distance for a given quantity of coal. It is always a very low speed; is rarely higher than that corresponding to 12 per cent. of the full forced-draught I.H.P., and in some vessels which have a very large proportion of power for their displacement the I.H.P. for most economical speed is a much lower proportion.

The nature of this speed and the circumstances affecting it can best be examined by means of a diagram, which is given on Fig. 1. The horizontal line OX represents the speed in knots per hour or the number of revolutions made by the engines per minute; the vertical line, quantity of coal expended in tons per day; the curve AE represents the expenditure of coal per day for any particular number of revolutions or speed. To construct this curve a number of actual runs must be made at various speeds, and the coal expenditure carefully measured in each case; the points representing the results are plotted off on the diagram, and a fair curve drawn through them. It will be found that a peculiarity of this curve is that if produced to the zero speed it will cut the line OY at some point, C, some distance from O, the distance OC representing the expenditure necessary to counteract the effects of radiation of heat from engines and boilers. The most economical speed and the consumption are represented by the point E, where the tangent drawn from O touches the curve AB, OD representing

the speed and DE the consumption. That this is so follows from the consideration that the most economical speed must be that where $\frac{ED}{DO}$ or $\frac{\text{expenditure}}{\text{speed}}$ is least. This value is constant for all points on the line OE, and is greater for all points above OE, that is, all other points on the curve AB represent a higher consumption for distance than the point E. One value of this method is that it is readily seen that for a wide range of speed about E the increase in expenditure is very trifling, the present figure showing that the speed may range from 30 to 60 revolutions, or 4 knots to $7\frac{1}{2}$ knots, without any considerable variation in the economy. In practice, it will generally be more desirable to steam at the higher speed, viz., $7\frac{1}{2}$ knots in the case considered, and this may be done without incurring any appreciable waste of fuel. The most economical speed varies with altered circumstances of weather, but when a series has been obtained under definite similar conditions they may be plotted out in the same way.

Also, in cases where it is necessary, with a given amount of coal on board, to steam the greatest distance with it, the coal used for the necessary auxiliary services must be taken into account, and can be represented on the diagram by drawing a line YY′, distant OY, equal to the auxiliary expenditure per day. The "most economical speed" must be obtained by drawing the tangent to AB through the point Y, which gives a speed greater than that obtained when the auxiliary services are not taken into account.

If this coal curve be closely examined in comparison with the I.H.P. curve, one or two important points will be noticed. Starting from the higher speeds, the I.H.P. curve falls rapidly as the speeds decrease until low speeds are reached, when the fall is less rapid, and at very low speeds indeed approach the direct proportion to the speeds as the influence of the constant engine friction becomes predominant. At high and moderate speeds, the coal curve approximates to the power curve, but falls less rapidly at the lower speeds, being affected by the amount of steam necessary to overcome the back pressure on the low pressure pistons and by the heat lost by radiation, the former being practically constant at all speeds and the latter constant if the same number of boilers be in use. These two sources of waste play an important part in increasing the quantity of steam used per I.H.P. at low speeds.

To reduce the rate of this increase as much as possible is one of the considerations that has led to the adoption of a lower ratio of volumes of the low and high pressure cylinders than is the practice in the merchant service, although this entails some sacrifice of economy at the higher speeds. The case quoted will show that a high degree of economy at even very low powers can be obtained from such engines. The proportion of cylinder volumes adopted for tri-compound engines of war-ships averages, about, high pressure, 1; intermediate pressure, $2\frac{1}{4}$; low pressure, 5; while for similar engines of merchant ships it is not infrequently 1, $2\frac{3}{4}$, 7.

To obtain the best results at low powers, it is most essential that the reduction of the power should be obtained, as far as possible, by increasing the rate of expansion, thus supplying the steam to the high pressure cylinder at a high pressure and cutting off the supply at an earlier part of the piston's stroke; the jacket pressures, within the limits already referred to, being so adjusted as to avoid unnecessary liquefaction. When steam at the full boiler pressure is admitted to the cylinder and the earliest practicable cut-off employed, the engines still develop a comparatively high power, and any further reduction must be effected by throttling the steam or reducing the pressure in the boilers. The latter is the preferable plan, but cannot be reduced below that necessary to promptly handle the main engines and to work the auxiliary engines.

As an illustration of how the advantages peculiar to a more advanced type of engine may be lost, the indicator diagrams in Fig. 2 are given. These are combined in the simplest way for the sake of a more ready comparison, and represent one set of three from a tri-compound engine, 130 lbs. boiler pressure, and one set of two from a bi-compound engine, 60 lbs. boiler pressure, both engines working at about 60 per cent. of their natural draught power. The difference between them is chiefly that a much later cut-off in the high pressure engine was adopted with the tri-compound engine, resulting in reducing the total ratio of expansion to less than in the bi-compound engine; there are also evidences of greater liquefaction. The tri-compound area, which represents the work done per stroke, is rather greater than that of the bi-compound; but the quantity of steam used, as indicated on the diagrams, is also as much greater as to make the economy of steam practically the same in each case, while the actual consumption of fuel per I.H.P. was slightly greater with the tri-compound. This engine, when worked with an earlier cut-off and steam in the cylinder jackets, has a substantial advantage in economy over the particular bi-compound engine referred to.

In the "Blake" and "Blenheim," whose engines are designed to develop exceptionally high powers, special arrangements have been made to keep down the coal expenditure at very low powers, and consist, as is generally known, in fitting two separate sets of engines to each of the two propeller shafts. In peace-time, it was intended that the forward engines should be disconnected, and the two after ones alone used. Thus, when steaming at a comparatively low rate of speed with the after engines only, the proportion of the corresponding I.H.P. to the full power would be half what it would be if all the engines were in use. From experience with the "Blake" under the two conditions, the consequent reduction in coal expenditure per knot at 9·6 knots has proved to be substantial.

In some ships the maximum power of the engines during peace service has been reduced by fitting a special slide valve with increased lap to the high pressure engines, the eccentrics being suitably adjusted. This arrangement has only been applied to some recent ships, and sufficient experience has not yet been obtained to show the effect on the economy of steam.

With regard to adapting the boilers to low speed steaming, the subdivision into several boilers, necessary in most ships from other considerations, enables the boiler power to be properly proportioned over a large range to the actual power to be developed by the engines. The usual conditions of men-of-war steaming, however, render it generally necessary to have steam up in a greater number of boilers than is required to develop the average I.H.P. economically, as the variation in revolutions and auxiliary work above referred to demands that steam should be quickly available for the maximum requirements. This not only increases the waste arising from radiation, but also from the irregular firing necessary to meet the varying demands of the engines.

When the number of boilers in use is much above the average requirements of the engines, and the maximum is not wanted to be exerted too suddenly, recourse is frequently had to the reduction of the grate area. This, by increasing the proportion of heating surface to grate area, and by affording a larger space for the combustion of the coal gases, tends to greater economy. This reduction of grate can be readily effected by allowing the back bars to become clinkered over, or, in some cases, the service renders it possible to brick over these bars; vertical plates have also been used, placed in the ash pits transversely so as to prevent air having access to the length of fire bars behind, and have been found to be beneficial in some cases.

It has often been suggested that, at low powers, the use of only one engine and screw of a twin-screw ship might be more economical than using both engines. This has been tried by many ships, with the result that, down to powers as low as 10 per cent. of the natural draught power, there is no saving of fuel, and often a substantial loss. These show that the falling off in speed caused by the resistance of the rudder and idle screw is so great as to more than counteract the increased efficiency produced by developing the whole of the power in one engine, and the reduced waste caused by the elimination of the engine resistance and back pressure of the engine which is stopped. In most of the trials the idle screws were not disconnected from the engines, but, if they had been, there is sufficient experience to make it probable that they would not have revolved at that power, and the practice is also open to the strong objection that the control of the ship is seriously impaired. An average result from a battle-ship may be quoted, where the one-tenth I.H.P. was 900, the speed with two screws 6·8 knots, the speed with one screw 5·3 knots, the distance made good per ton of coal with two screws $7\frac{1}{2}$ knots, and that for one screw $5\frac{1}{4}$ knots. The percentage of loss was therefore 30, and a reduced speed of $1\frac{1}{2}$ knots into the bargain. At higher speeds the single screw method is still more unfavourable.

There have been a few cases where some economy has been obtained at from 3 to 5 per cent. of the natural draught power, due apparently to the circumstance that at extremely low powers the inefficiency of the engines rapidly increases. The corresponding speed is, however, so low that it may be doubted whether it would prove of any practical value. Even at these low powers it would

appear that the economy is largely dependent upon conditions of weather, and if economy were proved in a given ship under certain circumstances, it would probably disappear if the circumstances were even slightly altered.

A proposal has been made to disconnect the L.P. cylinder of a triple expansion engine at low powers, and thus develop a higher proportion of full power, say 30 per cent. in a bi-compound engine of cylinder ratio $2\frac{1}{4} : 1$, instead of 20 per cent. in a tri-compound engine of double that ratio. This proposal is based, however, on the supposition that the loss of efficiency of tri-compound engines is very great at low powers; but experience generally in the navy engines, including the example already quoted, shows that, over a wide range of power, this is not the case; and that the coal expended per I.H.P. when using all three cylinders is materially below that of a bi-compound engine having a comparatively low ratio of cylinders, although the low power developed is in a somewhat higher proportion to the full power in the latter case than in the former. This difference in coal per I.H.P., in favour of working with three cylinders, is also found to be sufficient to counteract the loss sustained by the engine friction of the L.P. cylinder, and thus leads to the conclusion that no economical advantage is to be gained by the adoption of the proposal under consideration.

An instance of some interest may be given, although it only indirectly bears upon the question. It is, however, a case where a comparatively low power was developed with a cylinder ratio reduced to half the total ratio of the complete engine. The vessel referred to had bi-compound engines of the three-cylinder type, one H.P. and two L.P., the total ratio of volumes being $3{\cdot}72 : 1$. One of the L.P. engines became disabled, and the ship steamed 6,000 knots at about $\frac{1}{4}$ power with only one H.P. and one L.P. cylinder, the ratios being then $1{\cdot}86 : 1$. The practical result was a coal expenditure per hour per I.H.P. of 3·5 lbs. against 2·4 lbs. when all cylinders were in use, developing the same power. Indicator diagrams to show the distribution of steam when using two cylinders are given in Fig. 3, and also, for comparison, a set when using about the same quantity of steam per stroke when all engines were in use. These show that part of the increased coal expenditure was due to increase of back pressure, due apparently in some measure to the whole of the steam entering at one end of the condenser; but, making an allowance for this, the expenditure of steam was much greater than when using the whole of the engines.

The coal expenditure for auxiliary purposes is a very material item in war-ships compared with the quantity used for propulsion. In the course of a year the larger modern ships generally burn as much or more for the first as the last; this is partly absolute, on account of the increase in the number of auxiliary services for which coal is used, and partly relative, on account of the low average speed and time under way, as compared with a merchant steamer. The proportion becomes considerably lessened in the case of a passage at a fairly high power, say at half the full power, the proportion between

the coal for auxiliary services and that for propulsion being then about 9 per cent.

To afford an idea of the magnitude of the auxiliary engines on board a modern ship, it may be stated that on one of the most important there are 58 distinct engines, not including boat engines, the I.H.P. amounting in the aggregate to quite 2,000. This, if continuously developed, would mean an enormous expenditure and considerably beyond what is actually incurred. As a matter of fact, several of these engines are only duplicates of others, and would not be used at the same time with them; and many are only used intermittently.

It should be mentioned here that the auxiliary engines here referred to are only those which are used for purposes distinct from propulsion. The coal expenditure for such engines as the main circulating engines, main feed engines, and starting engines is included with that for propulsion. Many of the auxiliary engines do not lend themselves to economical working, as some are necessarily so far removed from the source of steam that considerable condensation takes place in transit, also they receive their steam supply at a reduced pressure and exhaust it against a comparatively high pressure. The work of some is of such a character that it is impossible to employ any material degree of expansion or to compound the cylinders. To obtain the greatest economy possible, those which can be so treated are compounded, and also a separate auxiliary boiler is fitted where one of the main boilers is too large for the work; or, in some cases where the main boilers are of the double-ended type, for one of these, two single-ended boilers have been substituted.

The electric light engines deserve special consideration, as one or more are in use in many ships practically all the year round, and necessitate, consequently, a considerable total expenditure of coal. These are now made, and have been for some years past, on the compound principle, and a very early cut-off employed in the high pressure cylinders, thus allowing of a high total rate of expansion. Every engine is tried carefully at a Government dockyard to determine the quantity of steam it consumes, and a certain standard of economy must be attained. These trials afford some useful facts as to their consumption under the trial conditions, but, as will be supposed, this will be subject to some modification when in use on board ship. On these trials no account is taken of the steam used by the feed pump, nor of the condensation which takes place in long leads of steam pipe, nor of the amount of coal used when fires are cleaned. With regard to the condensation in steam pipes, it is found on the trials on shore of the electric light engines that an amount of water is collected at the engine end of the supply pipe to the extent of 7 to 13 per cent. of the total steam used, although the length of pipe is comparatively short and is well lagged.

A case of the expenditures on board a battle-ship and on trial in the dockyard may be quoted; the steam consumption on trial was found to be for one electric light engine generating a current of 400 ampères such as to require a daily expenditure of 2·6 tons of

Welsh coal of good average quality. The reported expenditure from the ship is 3 tons per day; and the number of lights in use such as to require from one half to the full power of one engine. The case of "Warspite," 8,400 tons displacement, especially mentioned by Admiral Long, in his recent paper, showed an expenditure for lighting on passage out to her station of over 4 tons per day. This amount was perhaps larger than that really used, insufficient opportunities having occurred to enable it to be accurately determined. Later results showed an expenditure of about 3 tons and less per day, a reduction probably assisted by economy in the number of lights and length of time in use. The reduced expenditure, however, does not appear excessive when it is considered that the engines are of the simple type.

Distillation of sea water is also an important item of coal expenditure. On a large ship fresh water is often required to the extent of about 12 tons per day for drinking, cooking, and washing, and about $\frac{1}{8}$ ton of water per ton of coal burnt in the boilers to make up losses of steam and water from the boilers, engines, pipes, joints, valves, &c. Both of these amounts are of a very elastic nature, and in many cases it has been found possible to materially reduce them below these figures. When direct distillation from the boilers was employed, as in the older ships, a very fair return was obtained for 1 ton of coal, averaging about $7\frac{1}{2}$ to 8 tons of fresh water. When, to avoid large quantities of scale being deposited in the boilers, double distillers were adopted, the quantity of fresh water obtained for 1 ton of coal was reduced to about 5 to $5\frac{1}{2}$, the loss resulting principally from condensation of primary steam on its way to the evaporator and to the high temperature it possessed when escaping as water from the evaporator. Compound double distillers were tried and found to result in a considerable gain in the quantity of water produced for a given expenditure of fuel, and in recent ships a pair of double distillers is so fitted that they may be worked in this way. It is arranged, however, that each distiller can be worked separately when urgency requires the greatest output to be made. It may be said here, in connection with this point, that it not infrequently happens that economy of fuel and economy of weight and space do not go together, and hence, in a man-of-war, where economy of weight and space is of such importance, economy of fuel must often to some extent be sacrificed.

Under some circumstances of naval work, economy of coal may be of such importance that, beyond working the machinery so as to fulfil its services with the least expenditure of coal, it may be desirable and possible to dispense with some of them altogether. The character of the work must determine which of them can be dispensed with, but those which appear to lend themselves to this are the steering and electric lighting engines. Both of these use up considerable quantities of coal, which can be saved for other purposes by steering with the hand gear and using oil and candles for lighting purposes.

The exact advantage to be gained by this course depends upon the service, and is greater the slower the rate of speed. A large cruiser,

say, carries 1,000 tons of coal; at 10 knots speed under good conditions this will carry her, with all the ordinary auxiliary purposes in use, about 7,700 knots; if the steam steering and electric lighting engines be stopped, she will be able to cover about 8,700 knots, a gain in distance of 1,000 knots, or $\frac{1}{8}$th more. At a high power, say, 60 per cent. of the natural draught, she may steam about 3,000 knots in the one case, and 3,100 in the other, the gain in distance being only 100 knots, or $\frac{1}{30}$th more.

Before concluding this paper, the progress of the coal question may be illustrated by giving some particulars of the passage of three vessels, fitted with progressive types of machinery, out to the same distant station. The first had simple engines and very little auxiliary machinery, and steamed the distance of 7,082 knots at an average speed of 5·5 knots; 1,575 knots were made under steam only, 5,071 under steam and sail, and 436 under sail only; the total coal expenditure was 1,046 tons. The effect in this case of using sail power when steaming, besides increasing the speed $1\frac{1}{2}$ knots, was to reduce the coal expenditure per knot to less than one half what it was when the vessel was under steam only. The second vessel had bi-compound engines, boiler pressure 90 lbs. per sq. in., was fitted with a large amount of auxiliary machinery up to modern requirements, and steamed 6,985 knots at an average speed of 7·7 knots, with a total coal expenditure of 1,533 tons; this includes a considerable fraction for the main engines for purposes other than making good distance. The third vessel, a new ship, it is estimated from actual experience with similar types of engines, triple compound, 155 lbs. steam pressure, will steam the distance of 7,000 knots for 1,200 tons of coal at an average speed of $12\frac{1}{4}$ knots. To afford an idea of the comparative power to propel these ships, it may be stated that the H.P.'s required to drive them at 10 knots per hour are respectively 1,500, 1,500, and 1,350, smooth water and clean bottoms.

The first two cases showed a very material reduction in the coal expenditure for power developed in favour of the bi-compound engine; but the total amount of coal went up considerably. This is almost fully accounted for by the facts that she had no help from sails, steamed at a higher average speed, and had a greatly increased amount of auxiliary machinery in use. The expenditure for the tri-compound engines should show a still further economy for work done, but it is not likely that the total expenditure will fall below that of the ship fitted with simple engines, on account of the very much larger amount of work to be performed by the machinery.

A review of some of the remarks in this paper will show that much has been done in the construction of the machinery of war-ships to enable economy of fuel to be obtained, but that the realization of this economy depends materially upon its use and treatment on actual service. So great is the influence of the latter, that improved treatment has been known to have nearly doubled the radius of action of a vessel that was obtained when the treatment was not so satisfactory. Some difficulties in the way of economical working have been considered, and it has been shown that the principal of these can be over-

come to such an extent as to obtain good results on actual service. Many of these difficulties are such as to be out of the control of officers in charge of the machinery, and it is in these respects that officers in command of ships may exercise material influence on coal expenditure, especially in such matters as economy in the use of auxiliary services and in steady running, and generally in the encouragement of those under them to use every effort to keep down expenditure to the lowest limit consistent with efficiency.

Mr. Wingfield: I have been very much struck with the ingenuity of the diagrams, which are entirely new to me, showing a very simple method of finding out from a series of trials the intervals between those experiments at which the ship would be steaming at the most economical rate. Diagrams are always more satisfactory for taking averages than simple arithmetic. You may approximate by an ordinary average, but if the experiments are reliable, you can get the absolutely correct point by means of a diagram, and I must congratulate the author upon the very ingenious arrangement that he has hit upon. Mr. Barnaby has just informed me that an American engineer, Mr. Hollis, has pointed out that there are two speeds at which the same economy is realized, and I see this diagram also clearly shows this to be a fact if the ship is not running at precisely the most economical speed. For instance, if the engines are running at 20 revolutions, the coal consumption is shown on the figure by E′D′.[1] A line drawn through O and E′ will, if produced, cut the curve again at E″, which is perpendicularly above 80 revolutions on the scale. The author has pointed out that, at any point on such a line as this, you are burning the same coal per nautical mile, hence a given distance can be run by the ship, whose performance is represented by this diagram, with the same weight of coals, whether running at 20 or at 80 revolutions. That is, the distance will be done in one-fourth the time at the higher speed, without any larger expenditure of coal. It is evident then that, if not quite sure what is the most economical speed, it is better to err on the fast side rather than on the slow, and, when cruising, orders should be given to run as near the economical speed as possible, but never at a *less* speed unless circumstances require it. Whenever a ship runs at a speed less than that of maximum economy, she is wasting time as there is another higher speed of equal economy. I think the great importance of this fact is self-evident. The coal per nautical mile = DE/24DO; as the triangles D′E′O and D″E″O are similar, it is evident that, as stated above, all points, such as E′, E″ on the slant line, represent equal weights per nautical mile, or equal radii of action for a given weight of coal burnt. The distance run per ton of coal is, of course, $24\frac{OD}{DE}$. There is one little point about the mode of action of the steam jacket. I think there are very few people who have studied the steam engine who doubt the great economy often realized by the use of the jacket. Opinions differ, however, as to the cause of this economy. I see the author speaks of the jacket imparting heat to the steam. I doubt if it is possible for the jacket to heat the steam much, if at all, except, of course, the very small proportion of the steam which happens to be in actual contact with the sides of the cylinder. The makers of superheating apparatus know this so well that they use small tubes, so as to cause as much of the steam to come in contact with the metal as possible. A very rough analogy may be found in the following hypothetical case:—Suppose we imagine an inclined plane made of some absorbent material, such as blotting paper. A current of air is passing under it, and keeps it dry, so that a drop of water, if let fall on the upper surface, will sink in and be dried up almost instantaneously. A number of bubbles are now poured on to the upper end of the plane, and are allowed to roll down it and off at the lower end. It is an object to secure as many bubbles at the end as possible out of the total number poured on. As the blotting paper is kept dry by the current of air

[1] A figure illustrative of Mr. Wingfield's remarks will be found in Plate 26.—Editor.

beneath it, those bubbles next it will burst and make way for another layer, which will also burst, and, the moisture being conducted away through the absorbent surface, layer after layer is destroyed. Only those bubbles touching the surface are, however, affected, and a certain percentage glide over them, and are caught as they fall from the lower end of the plane. These bubbles may be taken to remotely resemble the molecules of steam in their action, if heat is substituted for moisture. The layer of steam molecules next the cooler cylinder walls is condensed on entering the cylinder, and collapses, making room for another, and so on, but the steam in the centre of the cylinder is not affected. To return to the bubbles. Since the dryness (coldness) of the surface causes their collapse (condensation), it is evident that water (heat) must be substituted for the current of air (radiation and conduction). When the surface is thus kept moist (hot) the layer of bubbles (steam molecules) next it do not collapse, and serve as a cushion to keep the others from contact. A much larger proportion of the bubbles (steam) remains, therefore, at the end of the inclined plane (point of cut-off). Here, again, it is only the layer of bubbles (steam) next the surface which is directly affected; the rest is indirectly affected, as it is kept from contact by the uncollapsed (uncondensed) cushion of bubbles (steam). In the case of the engine, the jacket having done its work by keeping the sides of cylinder free from water, the loss during expansion, due to re-evaporation, does not take place. It is sometimes supposed that great losses occur from the exhaust steam conducting heat from the jackets. Steam is too poor a conductor to do this. Water will, and the jackets should be hot enough to prevent its accumulation before expansion commences. To sum up: the great gain derived from jackets is by preventing condensation and subsequent evaporation on the sides of the cylinder, and not by heating the mass of steam flowing into he cylinder. It follows that jackets are of most use where, as in small engines, the area of the sides bears a large proportion to the cubic capacity of the cylinders. In conclusion, I wish again to express my very great admiration of the author's diagram, which will, I am sure, be most useful.

Mr. WHITE: The concluding sentences of this paper sum up the lessons which should be learnt from its study. The paper will be of enormous value to the Service afloat. It is not merely a remarkable collection of illustrative examples of causes affecting coal expenditure, but contains also very valuable suggestions as to means whereby economies may be effected. Mr. Riley has made this matter one of the closest study. The paper will be circulated throughout the fleet in the Journal of this Institution, and I believe that it will lead to considerable practical benefit both to the Service and outside the Service. When we have it shown that by means of greater skill or experience in management the radius of action for a given coal supply may be doubled, we can see how important it is that both officers in command and those in charge of the engine room staff shall know in what direction to work in order to obtain economy. Mr. Riley does not make speculative statements, but deals with records of fact. In the same ship, at different periods of service, he shows that the radius of action has been doubled by savings due to better management alone. If I may venture to emphasize the statement made by Mr. Riley, I should wish to dwell upon the increased expenditure which may be involved in rapid variations of speed, or in uncertainty as to speed, or in the extended use of auxiliary services of various kinds. Sensible economies in coal may be effected by commanding officers if they set themselves the task of assisting engineer officers as much as possible. When I was afloat in the manœuvres of 1889, I made as close a study as I could of the conditions obtaining in a squadron on service. In that division of the fleet in which I was embarked, when we were at steam tactics at 8 knots, every ship had steam ready for at least 10 knots. Sometimes, in watching the manœuvres, I found ships were moving for a time at as high a speed as 12 knots in order to keep station. But the average speed of the tactical movements was only 8 knots. Clearly, such a command of steam and speed is absolutely necessary when a fleet is performing evolutions. Mr. Riley has well pointed out that there are conditions of service when considerations of economy in coal expenditure must give way to other considerations. But when a vessel is proceeding independently on a long voyage, by suitable arrangements much may be done in the way of coal economy. Take the illustration Mr. Riley gives of what

may be done by stopping the electric light, or the steam steering. The latter plan of course involves some more manual labour, but I have been more than once on board a battle-ship which was steered with perfect ease and success in making a passage by manual power. To show what can be done, I may add that in the case of the "Blake" or "Blenheim" the ship was steered by hand up to a speed of 18 knots. It is much more convenient, no doubt, to have one or two men only at a steam steering wheel, rather than many men at the hand steering wheel. But if economy of coal in making passages is aimed at, then in these, and in many other ways which Mr. Riley has hinted at, very much may be done. I do not desire to say more on this occasion, because my hope in coming was to hear the opinion of naval officers; but having closely read this paper, I must repeat the opinion that it is one of great practical value to the Naval Service. That value will be manifest more and more when the paper comes to be studied by officers afloat.

Admiral COLOMB: As naval officers are called upon to say something, I may say a word or two, because Mr. Riley is an old shipmate of mine, and I have no doubt that in times gone by we have talked over these questions in their earlier stages. There are one or two matters I am reminded of,—for instance, the economy of using one of two screws. I do not know whether Mr. Riley has data to show how the economy of using a single screw varies according to the direction of the wind. I do not know how it may be with the more recent classes of ships, but with the older classes of twin screws that I had to do with it was almost invariably found that when the wind blew 3 or 4 points on the bow, the economy of using the weather screw rose considerably over what the use of one screw did for instance when the wind was right ahead. The effect of the change of wind in that way was to require the ship, supposing she had been using the two screws, to carry rather more weather helm. The use of the single screw effected the purpose which so much weather helm did, and the consequence was that with the single screw you were able to keep the helm more in mid-ships. I hoped that we should have had in the paper some remarks on matters which have been a good deal before us recently—strongly before us in Lord Brassey's "Naval Annual" this year. I mean the vexed question of the effect of auxiliary services on the radius of action. Complaints are raised, I do not think myself properly raised, that the radius of action given in the tables represents a greater radius than really exists on account of the auxiliary engines. But it seems to me that what is wanted in the Service is some sort of factor, some sort of divisor which would discount the figures given, which I understand have simply to do with the powers of propulsion of the engines without taking anything else into account,—that if, corresponding to the different classes of ships, some discounting figure could be given, it would be always easy to tell at once what amount of deduction must be made from the nominal radius of action. I very much agree with Mr. White as to this paper being of the greatest possible value to the Service. I told my friend, on entering, that I had read the greater part of it and that it was a paper which could not provoke much discussion in this theatre, but that it certainly would provoke in the Service a great deal of very useful thought. I am glad to hear Mr. White attack the too great use of machinery on board ship. Where man-power is capable of doing the work I cannot help thinking it is very much better on board war-ships that the man-power should do it. I used to be made very low in my spirits with watching the machinery weighing the anchor when there was plenty of man-power to have done it, and the mass of man-power was looking on idly at the machine. In the same way with steering. It would be better for the Service if machinery should only be used for those purposes for which it is absolutely necessary, and that we should fall back on the muscular power which we are bound to have on board for fighting purposes so far as it can possibly be used. I must congratulate Mr. Riley on the excellence of the paper he has produced.

Mr. LIVERSEDGE, R.N.: I should like to point out a means of testing the accuracy with which coal has been measured. Suppose the H.P. is constant throughout the trial, then, if a line of coal consumption be plotted of which the "abscissa" is the total time and the "ordinate" the total coal used, the line should be a straight line; but if any error has been made in counting the number or weight of the buckets it would show itself by an alteration of slope of the

straight line. That method has been used by the Committee of Mechanical Engineers, and was found useful by them. The author, on page 3, gives the result of a special trial in which the consumption of coal per H.P. was measured at different percentages of full power. Professor Unwin, in a lecture to the Society of Arts, in January, gave curves showing that if the H.P. was decreased by decreasing speed or boiler pressure, the consumption per H.P. was increased at the reduced power; but if on the other hand the power was reduced by increasing the expansion the consumption per H.P. decreased. These results of the author's seem to fall under the latter head, and this result of Professor Unwin's would support the view taken by the author that the power should be reduced by increasing the expansion. It should be noted that the expansion should not be so great that the pressure at release in the low pressure cylinder is less than the sum of the back pressure together with the friction pressure. The expansion should not be carried on so far that the pressure at release in the low pressure cylinder falls below about 6 lbs., as Mr. Williams gives it, otherwise there will be a loss from excessive expansion. Then with regard to the steam jacket; the Committee appointed by the mechanical engineers recommended that the jacket should be so adjusted that the steam at release in the cylinder should be dry. This will agree with the author's condition that there should be some moisture on the sides during the stroke, since the release will not occur till about 0·8 to 0·95 of the stroke, and up to that point the steam will have contained a certain diminishing amount of moisture. Finally, I should like to ask the author a question. He gives the performance of the "Thunderer's" boilers as 9·6 lbs. of water evaporated per pound of fuel burnt. To make that information definite, I should like to ask the temperature of the feed water and the pressure of the boiler?

H.S.H. Prince Louis of Battenberg: I should like to make a few remarks from the point of view of captain of a ship, and to deal *seriatim* with a few of the hints which were thrown out, more especially as regards effecting economy in coal by restricting the expenditure for auxiliary purposes. I thought the matter over a great deal when I was in command of one of those small ships full of engines, and I came to the conclusion that really the only point in which you could possibly effect economy was electric lighting. Steering by hand is no doubt another point, but it should not be forgotten what, to my mind at least, is the chief advantage of steering by steam, viz.: the rapidity with which you can put the helm over to avoid danger. Under certain conditions no doubt you could steer equally well by hand, but if you get anywhere within frequented waters, working in a squadron or anything of the sort, I do not see how you could possibly do it. That and electric lighting are the only two items of expenditure which are pretty well permanent and constantly recurring, because, after all, the pumping machinery for torpedoes, weighing, stowing anchors, and so on, are intermittent. As Admiral Colomb said, as regards weighing the anchor no doubt you would have plenty of "beef" to do it without machinery, but then the question of time comes in. After all I take it you could do a great many things by hand in a ship: if you have unlimited time you have usually plenty of men to do it. In the "Dreadnought," we could load and trim our turrets by hand; it would take us about half an hour as against five minutes by machinery, and the same argument, I take it, applies wherever you use steam. With regard to the question Admiral Colomb raised about using one screw with the wind on the bow, I tried it and I found it certainly was so. It was the only point where we could use one screw, I would not say with advantage, but where it appeared to me to be really possible to use it. I am much struck by this diagram, Fig. 1. I assume that the author is the originator of it; I have never seen it before. It is very ingenious and also brings out how difficult it is to narrow down the economical speed. There must be for all practical purposes a large margin. Of course the faster you can do it for the same amount the better. After all, the captain of a ship is rather hampered in giving effect to economies in coal consumption, on the lines thrown out by Mr. White, for instance. As he rightly said: in the squadron you must have an excess of speed for tactical purposes and even for ordinary station-keeping purposes. But, in these days, the moment you are away from the flag there are two conditions: either you are told to go to a certain place at a certain speed, or else you are told to cruise within certain waters at your

discretion. Your other instructions tell you that when you are cruising you are to use what is called the "ordinary speed" according to the scale laid down, provided it is not faster than the most economical speed; so that in either case you are practically tied down by instructions, apart from the expediency of using your most economical speed. I should like to revert again, for a moment, to the question of electric lighting. In the "Scout," for example, we were peculiarly situated. We were the only ship in the Service then fitted with accumulator batteries. I was very much in favour of them after we found out how to work them. My engineers were, however, not very fond of them, as it gave them a great deal of extra trouble. I have never been able to clearly satisfy myself that it was more economical to use them as far as the coal comsumption went. Practically it meant a great deal more. In the Mediterranean summer cruise, where you frequently anchored for five or six days, she was the only ship in the squadron which put the whole of her fires out on anchoring, and it affected us more because we had no auxiliary boiler. Now besides being able to keep the boilers cleaner it reduced the temperature of the whole ship, and conduced to comfort and cleanliness generally. Lighting by accumulators could only be done by strictly economizing lights; we made rigid rules as to the use of incandescent lights, which worked very successfully.[1] As regards internal lighting generally, it has always struck me that nowadays, where formerly you burnt a purser's dip, you are not satisfied unless you have a 50-candle power light. Surely there must be some medium between the two. It is all very well turning night into day, but you would nowadays turn night into more than day itself ever can be. My impression is that the incandescent lights are somewhat recklessly used on board ship. It reduces their life and means of course increased expenditure of coal. That is a point on which, I am sure, by strict attention and going carefully into it, coal can be economized very largely.[2] The figures which Mr. Riley gives are quite extraordinary, as showing the difference in the radius and distance with and without the electric light, and they are well worthy of consideration. In fact this paper, I think, ought to do in that respect a great deal of good. I beg to congratulate Mr. Riley on having given us this very interesting and suggestive paper.

Mr. W. H. Riley: I am very much obliged to the meeting for the way in which they have received my paper. I understood Mr. Wingfield to say that he did not put very much faith in the value of steam jackets, and he gave a very ingenious explanation of their action. I know that the action going on inside the steam jacket and in the cylinder is very much a matter of conjecture, and, therefore, I was careful to confine myself to established facts. There have been trials made with naval engines under certain conditions, with and without the steam jacket in use, and it has been shown that steam jackets are of economical value. In a particular case I have in my mind of a bi-compound engine, the steam expanding about three times in each cylinder, the increase in horse-power was quite 10 per cent. with the same expenditure of fuel. The circumstances under which this trial was carried out were of a trustworthy character; and, moreover, the result is borne out by other cases in which an equal degree of economy was obtained. With regard to the point raised by Admiral Colomb, and confirmed by Prince Louis of Battenberg, of the effect of the direction of the wind on coal expenditure when steaming with one screw of a twin screw ship, I may say that there have been several cases reported where the change of the wind from the port to the starboard bow, or *vice versâ*, has turned an economical performance with one screw into a wasteful one compared with the results obtained when using both screws. This was one of the circumstances I had in view when inserting in that part of the paper dealing with this subject that "economy is largely dependent upon conditions of weather,

[1] I am afraid I strayed rather away from the point under discussion by mentioning accumulators. Their value has no doubt been decreased by the more general introduction of auxiliary boilers.—L. B.

[2] I meant to have added that I do not advocate any restriction in coal expenditure for internal lighting, fresh water for cleaning purposes, generally, &c., in times of peace. Coal is always to be had, and its generous use for the purposes enumerated undoubtedly adds vastly to the general well-being on board ship.—L. B.

&c." I did not go very deeply into the question of the effect of the auxiliary services on the radius of action, but the case I quoted I thought would be sufficient to show what was the effect in the special cases of the steering engine and the electric light. Any one may, from the diagram, Fig. 1, and knowing the total quantity of coal that can be carried, find what is the radius of action for each speed. This diagram represents an actual case, and gives the speed, the tons of coal expended per day for steaming, and also that for auxiliary purposes, and from these particulars other curves of radius of action can be plotted which would at once indicate the effect of the coal expended for auxiliary purposes. Mr. Liversedge anticipates that the economy at reduced power, in the case I have quoted, was produced by increasing the rate of expansion; that was so. As the power was reduced so the cut-off was made to take place earlier and the jacket pressure at the same time suitably adjusted. Undoubtedly this increased rate of expansion was an important factor in obtaining the economy at the lower power. I have not the figures at present as to the temperature of feed water in the case of the "Thunderer," when she evaporated 9·6 lbs. of water for each lb. of fuel; the temperature of the feed water is, however, that at which it was supplied to the boilers on board. I think I may say roughly it did not exceed 100°, and the boiler pressure was 110 lbs.[1]

The CHAIRMAN (Admiral Church): It is my duty now to bring this discussion to a close. I perfectly agree with Mr. White as to the great value of this paper, particularly to the executive officers of the fleet, more especially the officers in command of Her Majesty's ships. My opinion most entirely coincides with what has fallen from Prince Louis of Battenberg about the economy made in the auxiliary engines. There is no doubt that these engines are put into the ships to make them more efficient for the war purposes for which they are built, and if too much economy is observed in peace-time we should not be well up to working those very engines which we should have to use in war-time. I think it is absolutely necessary to use these engines in peace-time as we shall have to do in war. There is no doubt that in war-time the electric lighting of cabins and of the mess rooms will be dispensed with, but I do not see, myself, what other economy in that respect we could carry out. I think we are very much indebted to Mr. Riley for this admirable paper so cleverly drawn up, and also particularly for the diagrams which he has given us and which will be most useful in future. I am sure I am fulfilling the wishes of all present when I thank Mr. Riley very much for his paper.

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[1] Since reading this paper I have been made aware that the method described in it of obtaining the most economical speed is not new.—W. H. R.

Wednesday, June 21, 1893.

GENERAL THE RIGHT HON. SIR REDVERS H. BULLER, V.C., K.C.B., K.C.M.G., Adjutant-General to the Forces, in the Chair.

MOBILIZATION FOR HOME DEFENCE.

By Major FRANCIS G. STONE, R.A., Brigade Major S. E. District, G.M., S.M., R.A. Inst.

IN dealing with this important subject I wish to define my position clearly; the object of this paper is not to advocate any cherished views of my own, neither is it to attack the views of others; it is simply an effort to attract something more than passing attention to the official regulations and orders on which our authorized schemes of mobilization for home defence are based; and, so far as lies in my power, to awaken a practical interest in a subject which officers of every rank and every branch of the Service ought to be conversant with.

ORGANIZATION OF THE ARMY.

In order to obtain a comprehensive view of the subject of mobilization for home defence, and to understand the full bearing of the regulations on the various details which we shall ultimately discuss, let us examine the existing organization of our offensive and defensive resources.

The troops at our disposal within the United Kingdom, excluding depôts are—

Regulars.....	21 cavalry regiments.
	9 batteries horse artillery.
	38 batteries field artillery.
	20 companies garrison artillery.
	27 companies Royal Engineers.
	72 battalions infantry.
	38 companies Army Service Corps.
Militia.....	32 regiments artillery.
	10 corps engineers.
	128 battalions infantry.
Volunteers	67 regiments artillery.
	28 corps engineers.
	212 battalions infantry.
Yeomanry.....	39 regiments.
Volunteers, light horse..	2 regiments.

In addition to the above there are certain remount companies, the nuclei of ammunition columns, the Army Medical Staff, the Ordnance Store Corps, &c., which have not been enumerated, but which will be found duly accounted for in the detailed tables.

For bringing up our regular forces to war establishment, we have an army Reserve of 76,500 trained soldiers, according to the latest Returns.

From the forces above enumerated provision is made for the following services:—

1. A field army, consisting of three army corps and four cavalry brigades.

2 A reserve field army.

3. Local defence—garrisons.

4. Unallotted units, available for any special service that may be required.

5. A suitable force for service abroad. Now, inasmuch as category 5 only concerns the subject of this lecture indirectly, I will deal with it first, and explain briefly how matters stand with reference to active service abroad.

For this purpose there is no organization *distinct*, and *in addition* to the field army for home defence: (if necessary) one army corps could be detached from home defence for service abroad by merely reducing the field army of three army corps to that extent, and adding such extra units as might be required for base and line of communication from the unallotted units; such a procedure would be perfectly feasible, but would naturally only be undertaken in view of certain Continental complications which need not be discussed.

What may, however, at any time come suddenly, and not unfrequently within the purview of practical operations abroad, is the immediate dispatch of a suitable force to any part of the world to safeguard our colonial interests; for this purpose, a portion of the 1st Army Corps is held in readiness to embark for foreign service at the shortest notice; mobilization stores, on the service abroad scale, being kept in readiness at Aldershot and Southampton. The troops composing this force are—[1]

(*a*) One infantry division as laid down in "Field Army Establishments (Service abroad)" except that it will have a complete cavalry regiment, instead of one squadron only.

(*b*) One cavalry brigade, as laid down in "Field Army Establishments (Service abroad)."

(*c*) One Mounted Infantry battalion, one Mounted Infantry machine gun section, as laid down in "Field Army Establishments (Service abroad)."

(*d*) Certain additional units for base and line of communications, &c., as laid down by H.G.W.O. Memo. "Storage of Mobilization Equipment," December 21, 1892.

All these troops belong also to the field army for service at home, but a separate detail is given in the "Field Force for Service Abroad" table.

[1] See "Storage of Mobilization Equipment," February 21, 1892.

Now with regard to the organization of our forces for service at home.

Category I is the field army, which, as already stated, consists of three army corps, the 1st and 2nd being composed entirely of Regulars, while the infantry portion of the 3rd consists principally of Militia; in addition to the three army corps there are four brigades of Regular cavalry, which are composed as follows:—[1]

Each cavalry brigade consists of:
- 3 regiments cavalry.
- 2 machine guns.
- 1 battery Royal Horse Artillery.
- 2 companies Mounted Infantry, with
- 2 machine guns.
- 1 company Army Service Corps.
- 1 bearer company.
- ½ field hospital.
- 1 ammunition column.

The 2nd Brigade has in addition a mounted detachment of Royal Engineers: the total numbers of each brigade vary, moreover, owing to two of the regiments in the 1st Brigade being Household Cavalry, on a lower establishment than cavalry of the Line, and to the necessarily uneven distribution of Headquarter Staff and details.

The total numbers for the four brigades are:

	1st Brigade.	2nd Brigade.	3rd Brigade.	4th Brigade.	Total.
Officers	125	139	131	131	526
Warrant officers, N.C.O.'s, and men	2,155	2,648	2,519	2,519	9,841
Guns	6	6	6	6	24
Machine guns	4	4	4	4	16
Horses	2,238	2,751	2,610	2,610	10,209
Carriages of all sorts	129	144	133	133	539

With regard to the infantry:—

Each infantry brigade consists of:[3]
- 4 battalions (each of 29 officers and 971 warrant officers, N.C.O.'s and men).
- 2 machine guns.
- 1 company Army Service Corps.
- 1 bearer company.

Total 130 officers, 4,113 warrant and N.C. officers and men.

[1] "Field Army Establishments (Home Defence)," pp. 151, 152. "Regulations for Mobilization for Home Defence," pp. 35, 36.

[2] "Field Army Establishments (Home Defence)," p. 143.

[3] The full establishment of a battalion is 29 officers and 982 other ranks; the surplus over a total of 1,000 is left at the depôt at place of concentration. See "Field Army Establishments (Home Defence)," p. 143, note (*b*).

Each infantry division consists of:

2 infantry brigades as above.
1 squadron cavalry.
3 batteries field artillery.
1 divisional ammunition column.
1 field company Royal Engineers.
1 company Army Service Corps.
1 field hospital.

Total, 323 officers, 9,460 warrant and N.C. officers and men, 18 guns, 4 machine guns, 1,641 horses and pack animals, 271 vehicles of sorts.

The normal constitution of an army corps is 3 infantry divisions as above: together with:—

Corps troops & details:
1 squadron of cavalry.
2 batteries horse artillery.
3 batteries field artillery.
1 field company R.E.
1 pontoon troop.
1 field park.
½ telegraph battalion.
1 battalion with machine gun section.
1 company army signallers.
1 company Army Service Corps.

It may be observed that the 1st Army Corps has an additional battery of horse artillery and also a balloon section; and that the 3rd Army Corps has no corps horse artillery, and no pontoon troop, telegraph battalion, or field park of corps engineers: these differences in the 3rd Army Corps appear in the "Regulations for Mobilization," dated 10th August, 1892, but no mention is made of them at pp. 147 and 148, "Field Army Establishments (Home Defence)," dated December 1, 1892. There is one other difference in the 3rd Army Corps, viz., that the Militia are formed into 24 battalions to take the place of 21 Regular battalions; this is assumed to make no practical difference numerically.

If we take it that the "Field Army Establishments" is correct, as being of later date, and that 2 batteries horse artillery, 1 pontoon troop, half telegraph battalion, 1 field park R.E. are going to be made good to the 3rd Army Corps before a reprint of the "Regulation for Mobilization" is issued, we therefore arrive at the following totals for the three army corps:—

	1st Army Corps.	2nd Army Corps.	3rd Army Corps.	Total.
Officers	1,129	1,118	1,118	3,365
Warrant officers, N.C.O.'s, and men	32,110	31,847	31,847	95,804
Guns	90	84	84	258
Machine guns	14	14	14	42
Horses and pack animals	7,416	7,135	7,255	21,806
Vehicles	1,149	1,115	1,142	3,406

Adding the numbers already given for the four cavalry brigades, we arrive at the following total in personnel and guns for the three army corps and four cavalry brigades:—

Officers	3,891	109,536
Warrant officers, N.C.O.'s, and men	105,645	
Guns, 12-pr. R.B.L.		282
Machine guns		58

We now come to Category II, which I have termed the "Reserve Field Army"; it consists entirely of Volunteer troops, "the intention probably being that if the army corps . . . have to move forward from their original places of concentration, these . . . shall remain in reserve, in occupation of the selected defensive positions."[1]

The troops composing this reserve field army are as follows:—[2]

22 Infantry Volunteer field brigades, 32 artillery Volunteer corps, comprising: 37 batteries of 16-prs. R.M.L. (4 guns), 12 batteries of 20-prs. R.M.L. (4 guns), 30 batteries of 40-prs. R.B.L. (4 guns). In all 79 batteries, with 316 guns.[3]

As regards the places of concentration of the troops in both the above categories, they are arranged with a view to certain strategical combinations, and are notified to all concerned.

Category III comprises garrisons and troops for local defence: The forces composing this category are placed at the disposal of General Officers Commanding districts, according to local requirements, and are dealt with in the local schemes of defence.

These schemes of defence may be briefly described as the organization of the district for a state of war, and, when the arrangements for the mobilization of the troops allotted for its defence are completed, the Officer Commanding every unit will know exactly where he will have to go, the nature of his duties, and the barracks, camp, or billets which his unit will occupy: the arrangements for all departmental services are cut and dry; and as in the case of mobilization of the field army, every staff, departmental, and regimental officer will know

[1] Colonel Lascelles' Lecture, p. 12.

[2] Mobilization Tables for Home Defence, Appendix L, pp. 11, 12.

[3] I have been informed that there are actually more than this number of batteries available; these figures are taken from Mobilization Tables, Appendix L.

exactly what to do when he receives the simple order to "mobilize"; if he does not, it is easy to ask for explanations and clear up difficulties in peace-time, and those who frame mobilization regulations and schemes of defence are only too glad to have any apparent difficulties pointed out, so that they may at once be cleared away.

The general plan on which the defence schemes in some of the larger districts, comprising a considerable stretch of coast line, are based is to provide strong garrisons for the fortress and defensive works, and small mobile field forces for reinforcing threatened points, preventing landings at undefended portions of the coast, opposing raids, harassing the enemy's base or line of communications, and thus preventing him from having an absolutely free hand in the more serious engagements with the field army, which must actually decide the fate of the Empire. It is of importance to note in this connection that many distinguished officers hold the view that one of the most probable plans of invasion is to attempt a landing in small force at several points, and to follow it up by an invasion in force, along one or more lines of advance, according to the initial advantages and freedom from attack which the various landing places offer at the outset of the operations.

The troops told off under Category III (garrisons) consist of all arms and branches of the Service.

Category IV consists of unallotted units, available for special service as may be required: such special service might be the reinforcement of the field army in the event of the 1st Army Corps, or a portion thereof, being ordered on foreign service, strengthening a home or colonial garrison, &c.

Scheme of Defence for the United Kingdom.

The principles which guided the framers of our scheme of defence are based on the following postulates:—

I. That an invader's objective is London, and that until London is taken no invasion can be considered entirely successful.

II. That it is essential to prevent an invader from seizing any important fortified points, or commercial harbours, which would give him an initial advantage.

III. That, after having due regard to II, our forces must not be frittered away by extending them in a long chain of guard posts all along the coast, with the idea—impossible to carry out—of preventing a landing at any point; but that our forces must be concentrated and mobile, and capable of striking a decisive blow wherever and whenever the invader can be met to the best advantage, *after* a landing has been effected.

The soundness of the strategical conception of the question is generally admitted by military men; but the lay mind undoubtedly requires a little education on the third point, in order to prevent the risk of unreasoning panic at a critical juncture, which may quite possibly compel the military authorities to some serious false step in deference to the fiat of uneducated public opinion.

The Press will have a serious responsibility if ever invasion becomes a reality, and it is to be hoped that it will remember that though an English county may be overrun by the invader, without opposition, any apparent inaction of the military authorities in the local centre of disturbance is only a necessary part of a comprehensive plan for striking a single crushing blow at the enemy under more favourable circumstances elsewhere.

Anything like local panics is much to be deprecated; the country may rest assured that if the army is given a free hand, under its appointed leaders, and the strings not pulled by local agitators or impatient politicians, the result is a foregone conclusion. It is one thing for an enemy to land in a country like this, it is a totally different thing to overcome the resistance to be met with after landing, and to retire gracefully with the laurels of victory. Napoleon led an army to Moscow, but he only brought a few hundred men back to France.

There is one other point in connection with this subject on which the public requires enlightenment—it is the threat of bombardment. There are certain wealthy commercial towns and pleasure resorts on the coast, which are by some supposed to be open to the exaction of an enormous ransom by the captain of any passing cruiser who threatens a bombardment. Let the inhabitants of such towns rest assured that the threat will be a threat and nothing more; such attempted exactions are merely a game of brag, and, if the Mayor refuses to be bounced, the town will not suffer.

The reasons are evident:

1. Bombardment of an unfortified town, which has no military garrison, is an act of pure brigandage; it is waging war against the inhabitants, which is so absolutely contrary to the accepted code of civilized warfare that no European nation would care to incur the odium of such an act.

2. The game is not worth the candle; one or two shells fired to create a panic are all that a ship of war could venture to spare, when at any moment it might require its full complement of ammunition to decide a life and death struggle with one of our war-ships.

System of Mobilization Tables.

The system upon which the detail of troops for mobilization for home defence is based is two-fold: for the Regular army the detail is given by stations; for the local forces, viz., Yeomanry, Militia, and Volunteers it is given by corps.

The reason for this will at once be obvious, since, in the case of the Regular army, the units themselves change stations frequently, while the number and character of the units at each station remain practically constant: thus, instead of detailing the 28th, 38th, and 52nd Field Batteries for the 9th Division, we find the detail given simply as three field batteries—Shorncliffe.

On the other hand, it is evidently more convenient to detail the Yeomanry, Militia, and Volunteers by name, as their headquarters

never change, and this system is therefore pursued both in the War Office and Local Mobilization Tables.

The General Officer Commanding a district has usually three categories of troops to deal with :—

1. Those which move out of the district on mobilization.
2. Those which enter the district on mobilization.
3. Those which remain in the district.

The last two categories are dealt with under the Defence Scheme in full detail; the first category is only considered with regard to local defence, so far as to take cognizance of their presence in the event of a serious local emergency arising which would necessitate their mobilization being temporarily delayed in order to utilize their services locally.

It must be thoroughly understood, however, that the troops detailed for the field army are treated, as regards mobilization, quite distinctly from the scheme of Local Defence, which has nothing whatever to do with the mobilization of troops for the field army, and that nothing but the most serious emergency could justify a general in employing them in any manner which would delay their mobilization a single hour.

Equipment for Mobilization.

Full equipment for mobilization is only required for troops detailed for the field army; it is divided into three classes, viz. :—

1. The *Personal Outfit* of the soldier, which consists of his clothing and necessaries, furnished by the Army Clothing Department; and his personal equipment, viz., arms and accoutrements, which are furnished by the Ordnance Store Department.
2. The *First Regimental Equipment* of the unit, which consists of cooking utensils, butchery implements, harness and saddlery, intrenching tools, &c., and the vehicles in which these are carried.
3. The *Second Regimental Equipment* of the unit, which consists of the mobilization supply of ammunition and vehicles in which it is carried, supply wagons, ambulance wagons, and water carts.

Personal Outfit.—The clothing and necessaries for Reservists are kept at Pimlico, and will, on mobilization, be despatched to the various places at which Reservists are to join, as given in Appendix D of the "Mobilization Regulations"; the consignments will be sent off so as to arrive before the Reservists join, and no demands on the Clothing Department will be required. The amount of clothing and necessaries to be sent will be based on the total number of Reservists to join at each place.

The special articles of clothing and necessaries which are required for all troops on mobilization, in addition to the peace kit as maintained by units on a peace footing, and issued to Reservists at the depôts, will be issued direct from Pimlico to officers commanding units, the numbers being calculated on the war establishment of the unit.

The arms and accoutrements for the difference between the peace and war establishments of each unit are kept by the Ordnance Store Department at the peace station or place of mobilization of the unit.

First Regimental Equipment.—This is kept at the place of mobilization of each unit, on Ordnance Store charge. Mobilization Store tables, arranged in accordance with this classification, and giving the stores required by each unit on mobilization, are issued to officers commanding units. Copies of these tables are kept with the stores for each unit, as are also issue and receipt vouchers, which are filled in ready to be signed and passed by the officers concerned. Special demands will not be required on mobilization.[1]

Second Regimental Equipment.—This is kept on Ordnance Store charge at selected places, shown for each unit in the mobilization tables.

Horses.—The horses required for the mobilization of each unit will be collected at fixed horse centres by the Inspector-General of Remounts, and will be sent for, under his orders, by the units concerned, in accordance with the arrangements given in the mobilization tables.

Places connected with the Mobilization of Units.

It is well at this point to get clearly into our heads exactly what part the various places mentioned actually play in the mobilization of the units; a glance at the following table will make this clear:—

1	2	3	4	5
Place where Reservists join, and receive clothing and necessaries; usually the depôt.	Peace station, or place of mobilization where personal and 1st regimental equipment is kept.	Place where second regimental equipment is kept.	Centre from which horses are to be drawn.	Place of concentration notified to, or ordered by, General Officers Commanding districts, &c.

Columns 1, 2, 3, 4 are filled in in the published tables; column 5 is confidential.

As regards troops allotted to garrisons, columns 3 and 4 do not apply; such troops are provided only with the *Personal outfit of the soldier*, the necessary provision for intrenching tools, ammunition, transport, &c., being arranged for under the local defence schemes.

Procedure on Mobilization for Units of the Field Army.

The personal and first regimental equipment will be drawn from Ordnance Store Department at the place of mobilization.

On receipt of an intimation from the Inspector-General of Remounts that the horses are ready, the officer commanding a unit will send a party to the centre from which his horses are to be drawn (as per mobilization tables).

The number of horses required by any unit can readily be found by subtracting those already in charge of the unit from the numbers laid down in the "Field Army Establishments (Home Defence)."

[1] A.O. 75 of 1893.

The stores to be carried in regimental transport are—

a. Technical stores, according to branch of the Service.

b. Baggage and equipment.

c. Supplies for daily use.

No spare clothing, material for repair of clothing (with trifling exceptions), tents, blankets, hay, reserve rations, extra grocery ration, lime juice, or waterproof sheets (dismounted services) are to be carried. Detailed instructions as to packing, and the manner in which rations, forage, and technical stores are to be carried, will be found in the "Instruction in Regimental Transport Duties, 1892," pp. 85, 86; and in "Field Army Establishments (Home Defence)," pp. 11 to 15, and in the Field Service Handbooks of the various branches of the Service.

On the return of the party with the horses, the harness and saddlery will at once be fitted. A party, with the requisite number of horses, will then be despatched to draw the second regimental equipment from the Ordnance Store Department, and convey it to the place of concentration. In the meantime, the unit, having completed its mobilization in personnel and 1st regimental equipment, will proceed to the place of concentration under orders from the General Officer Commanding the district. On leaving its peace station, the unit comes under orders of the officer commanding the brigade, or other formation, to which it is allotted in the mobilization tables. On arriving at the place of concentration, the unit will be rejoined by the party detached to draw the 2nd regimental equipment.

Procedure on Mobilization for Units allotted to Garrisons.

The procedure is the same as for units allotted to the field army, except that, as already stated, there is no regimental equipment to be drawn; local arrangements being made to meet the requirements of these units at the places to which they are told off.

Reservists.

The following is the procedure for making up units to war strength:—

On receipt of the order to mobilize, all officers paying Reservists[1] will send each army reserve man in their payment a notice to join his depôt at once, accompanied by a p.o. for 3*s.* and the necessary railway and passage warrants.

In the meantime the officer commanding the Reservists (officers commanding depôts and regimental districts, see p. 30 "Mobilization Regulations") will have arranged with local authorities for posting placards (A.F. D 427 or D 451) in all conspicuous places calling out the Reserves; he will also have arranged for the receipt and care of clothing and necessaries from Pimlico, and for the accommodation, medical inspection, and clothing of Reservists as they join.

The officer commanding Reservists receives from the officer paying

[1] For list of officers paying Reservists, see "Mobilization Regulations," p. 32.

Reservists, the documents and A.F. O 1811 (Statement of Accounts on Transfer) for each man; he is required to settle up with each man for his reserve pay to the day preceding his reporting himself,[1] and ascertain whether he is married; if the fact of his marriage has not been recorded in his documents, the man will make a statutory declaration,[2] which will be passed to the officer paying reservists in order that the necessary arrangements may be made for issuing the separation allowance laid down in the "Allowance Regulations," para. 93.

It is to be observed that the "Allowance Regulations" do not appear to contemplate active service at home, inasmuch as the paragraph quoted seems to presuppose that barrack accommodation will be available; this paragraph requires to be modelled in the same form as paragraph 94, which refers to service abroad, and specially provides for the case of families not accommodated in barracks at nearly double rates, viz., 8*d.* a day for the wife and 2*d.* a day for each girl under 16 or boy under 14 years of age.

As soon as the Reservists are clothed and supplied with necessaries, they are to be despatched in suitable parties under an officer or N.C.O. to their units.

The officer commanding Reservists is kept acquainted with the requirements of the units, in his administrative sphere, by means of a Return[3] rendered on the 15th June and 15th December in each year, showing the numbers of each rank, exclusive of officers, required to complete to war establishment (home service) after deducting

a. Those who are not fit for service for home defence.

b. Those required for special services hereafter enumerated.

This information is brought up to date by officers commanding units telegraphing latest requirements, after completing the medical inspection of their units.

The Reservists, having joined their units, receive their arms and accoutrements, and the mobilization of the unit as regards men is completed.

Before leaving the Reservists, it is interesting to note that they have been called out on three occasions, viz., in 1878, 1882, and 1885, and on none of these occasions did the number of absentees, not satisfactorily accounted for, exceed 2 per cent.

Duties of Officers Commanding Units on receipt of Orders to Mobilize.

The procedure as regards completing the equipment to war footing has already been explained; the following details have to be attended to at once, and carried out in accordance with the "Mobilization Regulations" by every officer commanding a unit which forms part of the field army.

a. Medical inspection of all ranks.

b. Notification by telegraph to Military Secretary of the number of officers of each rank required to complete the war establishment, after

[1] Reserve Forces Act, 1882, Sections 19 and 24 (3).
[2] A.F. D. 418.
[3] "Mobilization Regulations," p. 12.

deducting those found unfit for service, or not available through being detailed for other duties.

c. Arrangements for receiving, accommodating, equipping, and arming Reservists as they arive from the depôt.

d. Arrangements for the accommodation in hired stabling, or by picketing of the horses for which there is no stabling in barracks.

e. On receipt of instructions from the Inspector-General of Remounts, despatch of a collecting party at the rate of one man to every two horses, under proper command, and accompanied, if possible, by a shoeing smith; this party to be provided with head-collars, head-ropes, T-bits, and nosebags, and to take with them to the horse centre any unfit horses able to travel in order to hand them over to the remount officer.

f. The despatch of all officers and soldiers unfit for service to the depôt; and of all soldiers' wives and families (exclusive of those of men going to the depôt) to the place of residence they may select in the United Kingdom.

On the completion of these arrangements, the O.C. the unit will telegraph to the G.O.C. the district that his mobilization is completed.

The foregoing describes the procedure as regards units allotted to the Field Army; the procedure in the case of units allotted to garrisons is conducted on the same principles, but is far simpler. Regular units allotted to garrisons are already quartered in the districts to which they are detailed for mobilization; units allotted to garrisons, whether Regulars, Militia, or Volunteers, have to mobilize at their headquarters complete in personal equipment, and bring with them to the camp or barracks to which they are told off in the local defence scheme all the ammunition in charge of the unit. Such regimental equipment as may be required is provided for in the local defence schemes and will be drawn on arrival.

It is to be noted in the case of units told off with machine gun sections to the field army, that the personnel of the section is in addition to that of the unit; the guns themselves will usually be in charge of the unit in peace-time, but if not they should at once be drawn from ordnance store.

Devolution of Mobilization.

We now come to a part of our National Defence Scheme where the energy and attention to regulations of individuals comes into prominence: and it is above all things necessary in this connection for us to bear steadily in mind the serious purpose for which we, as soldiers, "live and move and have our being"; drills, parades, manœuvres, gun practice, are all merely means to an end; that end is, in the last resort, the defence of our country; let this thought be ever present with us, not as an empty sentiment, but as a practical working factor in our military organization. Nothing should be left to the last moment which can by any possibility be done in peace-time: if we fail to organize in peace, rest assured that we shall fail to extemporize in war.

Our military organization and mobilization scheme for home defence is practically complete: the O.C. units know what the *unit* has to do, it rests with them that the unit is prepared to do what is required of it: this can only be the case if the component parts of the unit have themselves been organized in peace-time for mobilization; such organization embraces a field too wide to cover in such a lecture as this, but the following points may be instanced:—

1. Actual mustering of the personal and 1st regimental equipment, and, where possible, of the 2nd regimental equipment also, by the O.C. the unit, and thoroughly acquainting officers and N.C.O.'s with the lists of stores and the stores themselves, together with the method of packing them, &c., as laid down in the "Field Army Establishments (Home Defence)" and the handbooks for field service for each branch of the Service.

In the horse and field artillery "the battery station equipment will be packed, horsed, and taken out once a quarter, to ensure its being kept in serviceable condition."[1]

2. Keeping lists of officers and men, for drawing horses and 2no regimental equipment, mounted infantry, machine gun sections, ammunition columns, bearer companies, colonial reinforcements for garrison artillery, &c., so that at any moment the necessary detail could be detached to its special duty.

3. For troops allotted to garrisons which have an opportunity of exercising in conformity with the local defence scheme, a thorough knowledge of locality and personal acquaintance with the administrative and executive work which will have to be carried out in connection with their own unit or command.

4. Careful training and systematic detail of transport officers for regimental transport of units allotted to field army; practical acquaintance with fitting harness, management of convoys, packing baggage, &c., &c.

5. In the case of Volunteers, clear and concise standing orders as to reliefs, assembly of 1st relief, clothing and equipment to be carried, rations, ammunition, &c., and a thorough comprehension by every individual of what he is to do on receipt of a telegram to mobilize.

It is needless to instance further examples of what may be termed "Mobilization within the unit"; there is plenty of evidence that the responsibility of O.C. units is fully realized in many instances, but the subject is a new one, and it is only now that it has really assumed tangible form; it is necessary to remember that although it may be distinctly the duty of the Ordnance Store Department to have certain stores for certain units, it is quite as distinctly to the interest of the unit to see that the stores are actually available when required.

It may be as well to define the position of the O.S.D. with regard to mobilization stores—these stores are demanded as the regimental equipment for specified units; as such they are not ordnance stores available for issue for any other purpose than for the mobilization of those units: a separate compartment in the store houses is allotted to each unit and marked accordingly.

[1] "Equipment Regulations," Part 2, Peace Section XI, para. 17.

The Ordnance Store Department is responsible for the correct storage of the mobilization equipment, and is practically "caretaker" for it; it is not laid down that this equipment should be inspected by O.C. units, but there is nothing to prevent the G.O.C. a district ordering such an inspection or "muster" of mobilization equipment for every unit in his command, neither is there anything to prevent the O.C. a unit at any time from intimating to the S.O.S.O. that he wishes to inspect, muster, or draw a portion or the whole of the mobilization equipment of his unit for practice or instruction: the O.S.D. and the O.C. the unit should be in touch with each other; there are no conflicting interests to prevent a good understanding.

In the case of batteries of horse and field artillery, whose 2nd regimental equipment is, owing to circumstances, on Ordnance Store charge instead of on battery charge as "Station Equipment," the relative responsibility is very clearly laid down.

"The S.O.S.O. will be responsible at all times for the completeness and fitness for service of the battery station equipment. The O.C. the battery will always have power to inspect his battery station equipment, when in O.S. charge, and ascertain its condition, on his notifying to the O.S. officer his intention to do so, in order that the latter officer or his representative may be present."[1]

The normal state of affairs for batteries of horse and field artillery, will be for each battery to have its station equipment—*i.e.*, the difference between peace and war establishment—on its own charge. At Aldershot the batteries will be kept up to war establishment on the "Service Abroad" scale, which involves a slight increase of transport for tents, &c., and the additional personnel and equipment consequent thereon.

Mobilization of Yeomanry.

The allotment of the Yeomanry is given in Appendix L of the Mobilization Regulations issued with Army Orders, 1st February, 1893.

The greater part of this arm of the Service is organized into 17 brigades, while 7 regiments only are detailed for local defence.

Mobilization of Militia.

This will be proceeded with on much the same lines as the mobilization of regular units: the allotment is given in Appendix L abovementioned, and the allotment of units detailed for the Field Army is also given in Appendix E. The printed lists of ordnance stores show exactly what equipment is held on corps charge, and what has to be drawn from store in each case. Militia reservists join their Militia units at their own headquarters, and the mobilization of the men proceeds practically on the same lines as the assembling for annual training. The medical inspection has to be carried out as

[1] "Equipment Regulations," Part 2. Peace Section XI as amended by A.O., April 1, 1892, paras. 20 and 20*c*.

already laid down for Regular units; should the numbers called up and found fit for service exceed the establishment of the unit, the instructions of the O.C. the regimental district will be asked for as to the disposal of the surplus.

Mobilization of Volunteers.

The Volunteers, as already stated, are allotted to certain reserve positions in connection with the concentration of the Field Army and to garrisons: there are at present no Mobilization Regulations published to meet the case of the Volunteers, but the subject has, generally speaking, been dealt with under the various local defence schemes, in accordance with instructions received from the Horse Guards from time to time, and based on the "Volunteer Regulations."

Volunteers cannot be called out, except in the case of actual or apprehended invasion of any part of the United Kingdom; the occasion must first be communicated to both Houses of Parliament, if sitting; or declared in Council and notified by proclamation, if Parliament is not sitting.[1]

Volunteers when called out for actual military service are in all respects on the same footing as Regulars with regard to their obligation to serve wherever they may be required in Great Britain, under pain of being deemed in a state of desertion.

The defence schemes provide for calling out a certain proportion of the strength of each unit, reliefs being organized within the unit to meet the requirements of the defence schemes.

As regards pay, allowances, discipline, &c., mobilization places the Volunteers on the same footing as the Regulars.[2]

In addition to the arms and ammunition supplied by Government, and to the uniform found by the corps, the equipment of a Volunteer is divided into three heads.[3]

1. The minimum equipment necessary to enable him to take the field, viz.:—

Accoutrements complete, including pouches to carry 70 rounds.
Greatcoat.
Haversack.
Waterbottle.
Mess tin.

2. Additional articles which would be purchased out of the 2*l.* 2*s.* issued to the Commanding Officer of every Volunteer corps on mobilization for every efficient Volunteer in his corps. These consist of

Second pair of boots.
Knife and lanyard.
Blanket.
Valise.

[1] Volunteer Act, 1863, Section 17.
[2] *Ibid.*
[3] H.G.W.O. Mem. v. General No. d. 358, May 27, 1889.

In many corps the majority of these articles have already been provided; Commanding Officers are, however, required to make their own arrangements to ensure every man being in possession of them on mobilization, and it is to be clearly understood that they cannot then be supplied from Government stores.

3. Articles of camp equipment and technical stores which would be issued to the corps from Government stores at the place of concentration.

In every corps the standing orders should provide for the assembly of the first relief at the corps headquarters, the provision and inspection of the necessary equipment, and the dispatch of the relief to the place of concentration or garrison by rail or otherwise.

The order to mobilize will be either accompanied or followed by instructions as to subsequent concentration, together with the necessary route for the journey.

"Mobilization within the unit," already alluded to, is of paramount importance to Volunteers; nothing should be left to the last moment, but every detail of organization for service should be fully worked out in peace.

It is considered that Volunteer corps should be mobilized and ready to proceed to their garrisons or places of concentration within from 24 to 48 hours of the receipt of the order.

There is one point which requires constant attention on the part of officers commanding Volunteer units, and that is the close assimilation of the peace interior economy to that of war.

Pitching and striking camp, drawing barrack and camp equipment, cooking, messing, providing bâtmen and grooms, all these matters should receive attention at peace training, and every opportunity should be taken advantage of to render the unit self-reliant in respect of them.

Accommodation for Troops.

Allusion has already been made in brief terms to the duties of commanding officers in connection with the provision of suitable accommodation for their units during mobilization; this, however, is scarcely a question which can conveniently be dealt with piecemeal, and instructions have accordingly been issued[1] from the Horse Guards to General Officers Commanding districts to prepare a report, showing how it is proposed to accommodate the various troops which will be assembled in the district when mobilization is ordered. These troops may be classed as follows:—

1. Reservists, joining at the places laid down in regulations.
2. Militia corps assembled at their respective headquarters.
3. Yeomanry " " "
4. Infantry Volunteer brigades assembled at their places of assembly.
5. The remaining Volunteer corps assembled at their respective headquarters.

[1] 40116/3629, d. April 14, 1893.

It may be assumed that arrangements had already been made in most districts somewhat on the lines laid down, but the definite instructions now issued will in most cases cause some modification to be made in previous arrangements.

The guiding principles, however, would appear to be that:—

1. Where barracks are not available, camps are to be preferred to billets.

2. The distribution of camp equipment should, however, be governed, in the first instance, by the permanent requirements of the district after mobilization; the temporary requirements during mobilization being met by billets, if sufficient camp equipment is not available.

It may be expected, generally speaking, that it will be found most convenient to billet Yeomanry and Volunteers at their own headquarters prior to their departure for the place of concentration, whether they are allotted to the field army or to garrisons. On the other hand, barracks and camps will usually be made available for Regulars and Militia, such barracks and camps being in most cases conveniently situated for subsequent occupation by the troops (mostly Volunteers) which form the permanent garrisons for local defence.

Small Arms Ammunition.

For troops allotted to the field army the S.A. ammunition to be carried with the unit is given in the field army establishments (home defence), and in the list of ordnance stores required by units on mobilization, a schedule of which is given in Appendix K of the "Mobilization Regulations."

Now, as previously stated, the mobilization supply of S.A. ammunition and the vehicles in which it is carried form the 2nd regimental equipment of the unit: the mobilization supply of ammunition is the amount required to make up the complement per man to the number given for each unit in the field army establishments.

There is, however, an apparent discrepancy in the regulations on this subject which requires explanation, and it will be convenient for the purpose of illustration to take the case of a battalion of infantry. Page 107 F.A. Establishments gives the complement of ammunition of ammunition S.A., Lee-Metford, as

		No. of rounds per rifle or pistol.	No. of boxes.
Lee-Metford rifle.	On soldier.....	100	68
	Regtl. Reserve....	85	
Pistol.....	In possession.....	12	4
	Regtl. Reserve....	24	

Calculated on a fighting strength of 880 rifles and 26 pistols. The "Mobilization Regulations" provide for the whole of this ammunition being drawn as 2nd regimental equipment, but, as may be seen by note (m), p. 107, F.A. Establishments, the 4 S.A.A. carts drawn

with the 2nd regimental equipment are only capable of carrying 16 boxes each, or 64 boxes in all: if the pack mules are sent down to the place where 2nd regimental equipment is drawn, the remaining four boxes of rifle ammunition could be taken, thus providing for the transport of the whole of the regimental reserve of rifle ammunition.

We are now left in clear view of the apparent difficulty. There are still 100 rounds per rifle, and 12 rounds per pistol, which are carried on the soldier, as well as 24 rounds per pistol (four boxes), the whole of which is shown in the Table of Ordnance Stores (Appendix K, "Mobilization Regulations") as 2nd regimental equipment, and for which no transport is provided—it being laid down that this ammunition (as well as 16 boxes temporarily carried in the S.A.A. carts over and above the normal load) shall be carried on the soldier, and in the G.S. wagons of regimental transport; the soldier and the G.S. wagons, however, go direct from the place of mobilization to the place of concentration, and do not go to the place where the 2nd regimental equipment is drawn at all (unless it happens to coincide with the place of mobilization); so that apparently the greater part of the ammunition is in one place, and the means of carrying it in another place.

The explanation is this: the normal system of carrying ammunition, as laid down in F.A. Establishments, does not come into force until the unit reaches the place of concentration, and takes its place in the fighting formation (order of battle) to which it is allotted; a special transport service will be organized between the places of concentration and places where 2nd regimental equipment is drawn, with a view of completing the complement of ammunition of units whose place of mobilization does not coincide with the place where the 2nd regimental equipment is drawn.

In cases where the place of mobilization or peace station coincides with the place where the 2nd regimental equipment is kept, the unit starts on the march to the place of concentration, with the whole of its ammunition carried as laid down in F.A. Establishments, viz.:—

12 boxes in each S.A.A. cart.....	Total	48
16 boxes distributed between G.S. wagons....		16
On mules or in S.A.A. carts.....		4
Boxes.....		68

The ammunition on corps charge at the time of mobilization will be taken with the unit, and a corresponding deduction made from what is required to be drawn as 2nd regimental equipment as laid down in the tables for each unit. The ammunition on corps charge will consist of practice ammunition, drawn but unexpended, and the 20 rounds per man required to be kept up in peace-time in accordance with the "Equipment Regulations."[1]

Units allotted to garrisons will bring with them the whole of the ammunition on corps charge, and will supplement this on arrival by whatever may be arranged for under the local defence scheme.

[1] "Equipment Regulations," Part I, Peace, paras. 139, 140.

On mobilization, paragraph 60, Part I, "Equipment Regulations" will be suspended; this paragraph requires the return of all S.A. ammunition "previous to the departure of troops from a station . . . with the exception of a sufficient quantity to provide the guards and escorts with 20 rounds a man," and, as previously stated, each unit will leave its peace station with the whole of the S.A. ammunition which it has on charge.

Units to be formed on Mobilization.

The units to be formed on mobilization are—

Brigade, divisional, and corps staffs.
Regimental staffs of corps artillery and corps engineers.
Mounted infantry.
Army signallers.
Ammunition columns.

Bearer companies and field hospitals.
Remount centres and sick horse depôts.
Stationary and general hospitals.
Post office corps.
Military police.

The officers for the various staffs are detailed by the Military Secretary; the N.C.O.'s and men by the Adjutant-General and Deputy Adjutant-General R.A. or R.E., as the case may be: the equipment is kept at the places shown in the Mobilization Tables; the General or other officer commanding each staff will issue his own orders as to the assembly of his staff, &c.

For brigade, divisional, or corps staffs the A.S.C. provides transport, joining the staff units at their places of mobilization.

In the case of the regimental staffs the equipment is drawn with the transport, and the horses supplied by the Inspector-General of Remounts.

The *Mounted Infantry* will be formed into eight companies, and composed of men actually serving, with the exception of the sergeant farriers, who are detailed by the O.C. cavalry depôt, Canterbury, from cavalry Reservists.

The peace composition of the companies of Mounted Infantry will remain unchanged, any vacancies in a division will be made up regimentally by the battalion which has to furnish it.

The officer commanding Mounted Infantry submits on 1st March and 1st September, in each year, the detail of the eight companies to the Adjutant-General: officers commanding battalions concerned receive instructions accordingly, and on mobilization being ordered, send off their divisions complete with personal outfit (clothing and necessaries) to the place of mobilization without further orders.

A Company of Army Signallers consists of:—2 officers (captain or lieutenant), 1 company sergeant-major, 1 sergeant, 28 rank and file, 2 bâtmen.

The equipment (except clothing and necessaries) is kept by the O.S.D., the transport is provided by the A.S.C., the medical service is arranged by the General Officer Commanding the army corps: each army corps has one company of army signallers. The companies are formed on mobilization under orders from headquarters.

Ammunition columns are required for the following services, viz.:—

Corps troops ammunition column.
Infantry divisional ammunition column.
Cavalry brigade ammunition column.

Their composition is—

Corps troops.	3 officers (1 major and 2 lieutenants). 181 other ranks (including 1 warrant officer). 210 horses. 32 vehicles.
Infantry corps.	3 officers (as above). 193 other ranks. 222 horses. 38 vehicles.
Cavalry brigade.	3 officers (and 1 veterinary officer). 105 other ranks. 106 horses. 18 vehicles.

There are 16 of these columns, represented in peace-time by a nucleus of 1 warrant officer and 6 men Royal Artillery, in charge of the equipment; horses are drawn in the same manner as for other units, from the centres given in the "Mobilization Tables."

The officers are detailed by the Deputy Adjutant-General R.A., the N.C.O.'s and men by the O.C. Horse and Field Artillery, Woolwich, partly from men serving and partly from Reservists: the former proceed with personal outfit (clothing and necessaries) direct from their batteries to the place of mobilization; the latter receive their clothing and necessaries at Woolwich, and thence proceed to the place of mobilization. The 1st and 2nd regimental equipment and the personal equipment is held at the place of mobilization by the O.S.D. in the immediate custody of the warrant officer of the column.

Bearer Companies and Field Hospitals.

These have practically no peace organization, except on paper; and from this circumstance, combined with the somewhat complex detail which has to be carried out by medical officers, who change their stations with kaleidoscopic rapidity, the mobilization of these units promises to be an interesting experiment.

A bearer company consists of—

3 officers, 1 warrant and 60 N.C.O.'s and men, with 13 vehicles;

the transport is provided by the A.S.C. in accordance with "Field Army Establishments" and "Mobilization Tables." There is a bearer company allotted to each cavalry and infantry brigade.

A field hospital consists of—

5 officers, 1 warrant and 39 N.C.O.'s and men, with 5 vehicles; the transport is provided by the A.S.C. in accordance with "Field Army Establishments" and "Mobilization Tables." Field hospitals are divisible into halves; half a field hospital is allotted to each cavalry brigade, and an entire field hospital to each infantry division.

No. 8 Bearer Company, belonging to the 17th Brigade, would mobilize as follows:—The personnel is composed partly of officers and men now serving in the S.E. District, and detailed by name by the P.M.O., and partly by Reservists; the detail from the S.E. District of 3 officers, 15 warrant N.C.O.'s and men, proceed to Aldershot fully equipped; the remainder of the personnel is made up by Reservists at Aldershot, at which station they are clothed and equipped; the ordnance stores representing the 1st regimental equipment are also drawn at Aldershot. The medical stores will be sent from the Herbert Hospital, Woolwich, to Aldershot, and the medical comfort panniers from Woolwich Dockyard to Aldershot, by the Officer in Charge Supply Reserve Depôt; the transport will be furnished by one of the A.S.C. Companies at Shorncliffe, in accordance with the detail at p. 126, "Field Army Establishments (Home Defence)"—this Company draws its horses at Aldershot, but the harness is at Dover—the best plan would be, therefore, to send the 10 horses (with harness and drivers) necessary for the 2 G.S. wagons and 1 watercart, which are drawn by the bearer company as 1st regimental equipment at Aldershot, direct to that place from Shorncliffe. The 2nd regimental equipment is at present at Southampton, and consists of 10 ambulance wagons with accessories; if they were at Dover, as they are intended to be (when the necessary stores, &c., for a foreign expedition have been duplicated), they would be horsed by the A.S.C. Shorncliffe when the Company detailed for that duty had completed its mobilization, and would join the bearer company at the place of concentration, a portion of the detail furnished from the South-Eastern District being left at Dover to draw the ambulances and accompany them on the march. That the foregoing arrangements are open to criticism is patent to everyone, and until the medical service is more decentralized both in administration and material, it is to be feared that no amount of conjuring with existing facts will simplify matters; the constant change in the personnel of the Medical Staff, which makes efficiency in peace-time sufficiently difficult of attainment, will render the task of medical officers on mobilization supremely arduous.

Stationary and General Hospitals are organized by General Officers Commanding districts in their schemes of defence.

The *Military Police* mobilize at Aldershot; they do not appear as separate units, being included in the staff units of the formations to which they are allotted; the same rule holds for the Ordnance Store

Corps, and the Post-office Corps, which last is provided by the 24th *Middlesex Volunteer Rifle Corps.*

Rations.

On the day when a unit leaves its peace-station for the place of concentration, the rations will be drawn as usual, but on the field service scale, viz.:

1 lb. preserved meat.
1½ lb. bread or 1 lb. of biscuit.

4 oz. of groceries will in addition be provided locally by the commanding officer and carried in the panniers which form part of the 1st regimental equipment; the groceries will subsequently form part of the field-ration complete as drawn from the A.S.C. Supply officer. Each man is also served out with an emergency ration (1 lb. 1 oz. meat biscuit), which he carries with his kit and does not touch without orders. One field ration is carried in the regimental supply wagons for issue on arrival in camp or billets, and one field ration with the 1st line supply columns to replace issues.

Special arrangements require to be made to meet the case of Volunteer units during mobilization; the procedure would be practically the same as in the case of a militia unit assembling for training; the officer commanding a Volunteer unit would at once inform the Army Service Corps officer in charge of supplies of the orders which he had received for mobilization, and give him such additional information as would enable him to place the contract on a satisfactory footing during the time the unit would remain at its place of mobilization. The arrangements which would come into force on the unit taking up its war quarters are fully detailed in the defence schemes to meet every case.

Fitness for Service.

With regard to the medical inspection of units on mobilization, any men found permanently unfit will at once be discharged under Section XIX Queen's Regulations; men found temporarily unfit will be sent to hospital for treatment, or to the depôt, or, in the case of Yeomanry or Volunteers, to their homes, according to the judgment of the Commanding Officer after receiving the medical report.

All soldiers considered by the Commanding Officer to be capable of bearing arms will be regarded as fit for service, provided that they have completed a recruit's course of musketry (in cases of men to whom this is applicable).

Routes.

Special instructions will be issued to General Officers Commanding districts as to the issue of routes on mobilization. Officers commanding units should keep applications for routes for all services which

have to be carried out by them in readiness, wholly or partly filled in, according to the nature of the case.

Partial Mobilization of the IXth Division of the Field Army and of the S.E. Volunteer Infantry Brigade.

A most interesting experiment was carried out in the South-Eastern District at Whitsuntide this year, in the mobilization on a peace footing of the IXth Division of the field army in Ashdown Forest, south of East Grinstead, and the simultaneous assembly of the whole of the Volunteer battalions forming the South-Eastern Volunteer Brigade, in the same locality, under their brigadier.

Practically speaking, nearly every unit, shown at p. 47 of the "Mobilization Regulations" as belonging to the IXth Division, was concentrated in Ashdown Forest, the exceptions being

1 battalion "temporarily quartered at Aldershot."
2 bearer companies } represented by improvised
1 field hospital } arrangements.
1 squadron cavalry regiment, Shorncliffe, represented by a squadron from Royal Inniskilling Dragoons at Brighton.
No. 15 ammunition column—unrepresented.

The District Order for the mobilization ran as follows:—

"On the 15th May, it is supposed that the order to mobilize the IXth Division is received at 8 A.M. by the G.O.C. South-Eastern District. Officers commanding units will muster the whole of the personal and 1st and 2nd regimental equipment for their units at the stations given in detail in the 'Mobilization Regulations.' The stores will be compared with the 'Lists of Ordnance Stores' which have been issued to all concerned, and a list of deficiencies will be sent in by every officer commanding a unit to the Chief Staff Officer, South-Eastern District, accompanied by a certificate that the muster has been carried out in accordance with the instructions."

The results of this muster of equipment were more satisfactory than was expected, though some deficiencies were brought to light.

The assembly of the South-Eastern Volunteer Brigade at the same time was taken advantage of to work it as the advance guard of an invading force, and for this purpose a squadron of cavalry, a battery of field artillery, and a Volunteer battery of position were associated with it.

The IXth Division was entrusted with the defence of the Ashdown Forest position, which commands two important lines of advance from Lewes upon London.

For the first three days, no special ideas were issued, officers commanding opposing forces being given an absolutely free hand, within certain limits as regards hours and ground considered available for manœuvring.

The net results of this partial mobilization were in the highest

degree satisfactory; and I feel sure that many officers, who had previously never troubled their heads about the existence of such a thing as the IXth Division, for the first time in their lives began to look upon mobilization as a working reality, and a subject which might repay study.

Not the least important of the results obtained was the facility for studying three different branches of the Service, viz., Regulars, Militia, and Volunteers, each brigaded by themselves, but all working together on the same manœuvre ground. An object lesson of this kind is sometimes more convincing than the study of statistics and reports, even though the deductions may be somewhat different.

I cannot conclude without paying a well-deserved compliment to Captain Sichel, 3rd V.B. West Riding Regiment, for his excellent paper on "The Mobilization of the Volunteers." Many of his suggestions appear most valuable, and many are already acted upon more widely than he seems to think. As, however, I have little doubt that a chapter dealing with this subject will shortly be added to the "Mobilization Regulations," I have purposely refrained from any speculations thereon.

I regret that this lecture is incomplete in many interesting details, which have been necessarily omitted, in order to bring it within reasonable dimensions.

The CHAIRMAN: Gentlemen, we have listened to a most interesting lecture on, I am afraid, a very dry subject; indeed I am surprised that Major Stone has managed to so order his lecture as to make his materials more interesting, and to bring forward more points worthy of consideration, than I had feared he would be able to do when I heard what the subject of his lecture was going to be. But what the lecturer has told you is certainly perfectly true; there is no subject really, although perhaps it is the dullest of all, that is so interesting to members of the military force of the country as is mobilization. It is one that has only lately been taken up as a whole; in fact the Mobilization Regulations that have now been brought before you by Major Stone are, I believe, really an original attempt on the part of the authorities of the army to combine the whole military forces of the Crown in one general scheme, in which they shall equally bear their parts for the defence of their country. Any one of you who has ever thought what the previous organization of an army was, and how it has really grown more by the growth of single units than by any attempt to create an army as such—that is to say, an army with all the units bearing exact relative proportion in military value to each other—must, I think, see how very difficult any attempt to bring all those units into line at once must have been. Therefore it is evident that there must be a great number of points upon which a critic can lay his hand in the present Mobilization Regulations; but at the same time, if the principle is good, it stands to reason that the more those regulations are discussed, and the more the points that require amendment are brought to notice, the better it will be for the army at large, and, indeed, for the country. It was for that reason that when Major Stone asked me to take the chair at this lecture I was very glad to do so, because I hoped I should be able, as I am now, to say how very anxious I know everybody connected with the Mobilization Regulations of the army for home defence is that those Regulations should be made as perfect and as equable to all units concerned as possible. At the same time, of course, I can hardly sit here myself and take part in a discussion upon regulations for which I am, more or less, individually responsible; and so, with your permission, I shall ask your leave to retire. I thought, before I did so, I might give an illustration showing how very difficult it has been, in a certain way, to begin mobilization, and how many subjects there are so intimately interdependent,

that really it was hard to know where to begin when setting the military house in order for mobilization. The illustration I will give is that of storehouses. It is evidently necessary, before troops are fit to take the field, that they should receive an equipment for the field. It follows that it is necessary that the equipment should be provided at different places, and should be stored in storehouses. The first necessity was to provide for the distribution of the stores and equipment which had previously been kept at Woolwich among the different places where the various units were to mobilize. Then came the question of what the storehouses would cost, followed by the enquiry how big they would have to be, what stores would have to go into them? That was followed by the question of how these stores would be packed when in the houses; and then came the further question of what space, when packed, a certain number of stores would occupy? So that, in order to begin the simplest arrangement of mobilization, the whole question had to be worked out from the equipment of one man, first, to find out what each individual would require in the shape of equipment, then what all the individuals mobilized in a particular place would require; and then the whole of that equipment had to be got together and packed experimentally in order that it might be measured up so that the gross contents of the storehouse to be built thereafter could be arrived at. In short, you have, first of all, to settle what is wanted—a storehouse in this case—and then to go back through another set of facts to enquire how big the storehouse that you required should be. In every direction the same difficulty occurred. I know there is hardly an officer here present representing any particular branch of the Service who cannot point out difficulties and deficiencies that would attend the mobilization of his branch of the Service under the present regulations; but those difficulties and those deficiencies can only be met by careful forethought in peace-time, and by the provision of funds to carry out the alterations that are required. I am sure I am expressing what the Commander-in-Chief thinks, and what everybody who has had anything to do with the mobilization arrangements, believes, when I say that such a discussion, as I hope may ensue, will be of the greatest value; that nothing but a public expression of opinion of those who are most interested in the efficiency of the mobilization will bring before the public at large the difficulty and the initial cost that must accompany any plan for the efficient preparation of our military forces for their most important duty, namely, the defence of their country. I will now ask you to thank Major Stone for his lecture, and to allow me to leave the chair, because, in case any discussion is to follow, as I hope it will, I am sure you would feel that it would not be right for me to remain while such discussion was going on.

[General Buller then left the chair, which was taken by Colonel Walford, a member of the Council.]

Lord WILLIAM SEYMOUR: I think the lecturer has referred to this question as fully in detail as he was able to do under the circumstances. He has also referred to a small scheme of partial mobilization of the 9th Division last month in Ashdown Forest. It was a very partial one, as there were circumstances which prevented the Reserves being called out, and the Reserves not coming out, of course the horses and wagons were not forthcoming, though I understand that the Inspector-General of Remounts was quite able to produce the required number of horses from *his* reserves at a very few days' notice, and it was a pity for that reason that the Reserves not being called out, and the money, I suppose, not being forthcoming, the mobilization of the 9th Division was so partial. It has been referred to by the lecturer, and I need not give another account of it, but, in order to show how simple the Regulations for mobilization have become, I have only to remind you of the state of chaos that generally existed when a force, however small, has been prepared for active service, and the number of letters and telegrams that must, I think, have driven the officers commanding and preparing that force out of their senses. On this occasion it may be interesting to know, that from the first to the last, but six letters passed from the Horse Guards to the South-Eastern District, and, from the day of mobilization to the finish, but one telegram, and that was to report that the mobilization of the 9th Division was completed on Saturday, the 22nd May.

Lieut.-Colonel DOONER: There are few, I think, who will not acknowledge that this subject of mobilization for home defence is one of the most important that we

could have to consider, and our thanks are due, I think, to Major Stone for having brought it forward, and also to the Council of the United Service Institution for having kindly published all the orders on the subject in the Journal, by which means everyone who belongs to this Institution—and there are few now, I hope, in the military and naval services who are not members—can have the whole of the Regulations on their table at any time to refer to. With regard to these Regulations, I may say that last year I happened to be in command of a battalion, and therefore in command of a unit, and when they were published I studied them closely in order to thoroughly understand them and to see if it was possible, as the Adjutant-General has said, to lay one's finger on any point where perhaps some slight error had been made, and I must say it appeared to me that every possible detail had been well thought out and considered. If the order to mobilize had been given, I do not see what possible question any officer commanding a unit would have had to refer either to the authorities in the district to which he might belong or to the Horse Guards. With our organization however, in a difficult matter of this kind it is not to be supposed that there are not some points that perhaps might be improved, or upon which some little trouble might arise. One matter which struck me, for which, however, the military authorities are not responsible, and I may refer to it as the Adjutant-General apparently desires the orders to be criticised, was that when both battalions are abroad, the Reserves joining the depôt without any arrangement being made, as has been done where one battalion is at home, and no plan being made for forwarding on the Reservists who would be pouring into the depôts, with the small staff of officers and non-commissioned officers that we have in each of our regimental districts some trouble and difficulty may take place. It would be no easy matter arranging for the clothing and discipline of the large number of men who may be expected to join, and it must be remembered that in times of mobilization, in the case of apprehended invasion or approaching active service, there is always some little excitement, and the Reservists would join with a considerable amount of money due to them. It therefore seems to me that it would draw rather severely on the present staff of our regimental districts, seeing that the whole of the Reservists of both battalions would be pouring into the depôt, and no arrangements are made for forwarding them. The Regulations do not say that there shall be a provisional battalion formed. Perhaps there would be, but I think something ought to be done so that the depôt should not have to retain 500 or 600 men at one time, as they would be compelled to do if the present Regulations are to be carried out. This, I think, is one more argument in favour of what Lord Cardwell intended when he established our present organization, namely, that one battalion of each territorial regiment should always be at home while the other is abroad. If there is always one battalion in the United Kingdom, I do not see that any difficulty or trouble would arise—of course there will be plenty of hard work for all concerned—because men are to be sent on in parties of 100 as required, and they would come on to the home battalion, and then the crowd would not accumulate at the depôt as it would if both battalions were abroad.[1] The lecturer makes two suggestions to officers commanding units to

[1] I had intended to have suggested here, but omitted to do so through an error, that in order to lessen the strain on the depôt even under ordinary circumstances—by which I mean when one battalion of the territorial regiment is at home—it might be possible to permit those Reservists who may be residing out of their regimental districts, and who therefore might possibly be quite close to the headquarters of the home battalion, to join that battalion at once, if they desired it. This course would lessen a little the work on the staff at the depôt, and would also probably save expense. The home battalion would be quite equal to this; it is only a matter of drawing the Reservists' clothing and necessaries, and this could be done by the Commanding Officer of the battalion from Pimlico. It frequently happens that Reservists are not residing in their regimental districts, and might therefore be much nearer to the headquarters of the home battalion than to the depôt. This proposal would not, I estimate, refer to more than 15 or 20 per cent. of the Reserve, but to that amount it would decrease the work at the depôt.—W. T. D.

which I should like to refer. One is that an officer commanding a unit might in peace-time have lists of men ready for all the various duties, such as drawing horse equipment, mounted infantry, machine-gun section, ammunition column, bearer company, and all the other duties that would arise if the mobilization took place. Now I am afraid, with our organization as it is at present, it would be very difficult for the Commanding Officer to find sufficient or suitable men for all these various posts. He could not do it, I think, until he gets the Reserves from the depôt. When they come, of course he would have a good many more to choose from to carry out these duties. It might be possible in some cases to do it without the Reserve men; some regiments are better off than others; but I think, even if it were possible, that it would be better to let some of the Reservists get some of these various posts, because they would be older men and probably better suited for the different duties they would have to perform. It must not be forgotten that at present we send some 240 or 250 men every year from the home to the foreign battalion, and I need not tell you that when these men go away they are replaced by recruits coming in from the depôt by batches every six weeks, and thus new lists would continually have to be made out. Then Major Stone makes a suggestion that the officer commanding a unit might notify to the senior ordnance store officer that he is going to inspect the regimental equipment, &c., and also to draw it. Now I am afraid that without some local order, or Army Order, being issued on this subject some little friction might perhaps take place. The senior ordnance store officer might call for the authority, and it is a peculiar thing, as Major Stone points out to us, that it is permitted in the case of artillery, but apparently the infantry have been forgotten.

Major STONE: That is quite correct: the artillery are provided for in the Equipment Regulations and the infantry are not.

Lieut.-Colonel DOONER: I have just been informed that the difficulty I foresaw will probably not arise. Of course I took what was stated in the lecture to be exactly correct. In conclusion, I would say that with these Regulations before us, on the presumption that the staff at the depôts are sufficient for the work required, and that the necessary transport and equipment are ready, I do not see how any difficulty can arise should a mobilization for home defence be ordered. The Regulations seem to me to have provided for everything, and any officer commanding a unit has only to study them, and he will certainly find all the information he requires. If this is done, I do not think any of our senior officers would find themselves, were mobilization ordered, in the predicament in which a French General was who went to Belfort in the 1870–71 campaign, and when he got there found none of his army corps or subordinate commanders. In this unhappy position, he telegraphed in a state of some anxiety to the War Minister, "Have arrived; have not found either my brigade or divisional commanders; what am I to do? I do not even know where my regiments are."

Major A. M. MURRAY, R.A.: I beg your permission, sir, to ask Major Stone if he would kindly say before the discussion closes whether these three army corps and these four cavalry brigades mentioned in his lecture can be easily made available for foreign service? I rather gathered from his lecture that one of these army corps is so available, but not the other two. Will he kindly say whether in the case of the other two army corps the necessary tents and equipment are provided? I think there is some difference in the tables of equipment for home service mobilization and those for foreign service. It would be interesting to know whether the necessary tents are ready, and whether in case necessity arose the extra transport wagons are actually present, so that we could equip these three army corps and send them abroad with four cavalry brigades. Some four or five years ago it was stated in the House of Commons, by Mr. Stanhope, that the fixed policy of the Government was to have two army corps ready for foreign service, one cavalry division, and the necessary troops for the lines of communication. Are we to understand now that that policy has been abandoned? I think the minds of most soldiers are always much more fixed abroad than they are at home. Many of us do not believe in the practical possibility of an invasion of this country. I think we have only to read our own military history to show us most conclusively and convincingly that without permanent command of the sea—

temporary command is of no avail—there cannot be successful invasion. A distinguished member of this Institution—I mean Admiral Colomb—has pointed this out most forcibly in his work on "Naval Warfare." I think, therefore, that this question of home defence is scarcely a practical one. It is rather academical. Mobilizing for home defence is quite a new departure in the annals of our military history. The only time, I believe, when England ever mobilized for home defence was in the reign of Charles II, when the Dutch fleet came up the Thames and burnt the English vessels under the eyes of the troops which had been mobilized for home defence. We did not break down the power of Napoleon by mobilizing for home defence. In those days we used to mobilize for foreign attack; we sent our armies abroad, found out our enemies, and then beat them in the open field in a fair fight. We did not build up our Indian Empire by mobilizing for home defence, and we shall not retain it by mobilizing for home defence. We did not win our position in Egypt by mobilizing for home defence, and if that position is ever threatened by any foreign Power we shall not secure and safeguard it by keeping our troops mobilized for home defence, locked up in England, waiting to attack an imaginary enemy, which, so long as we retain command of the sea, never can be a practical possibility. It is for some of these reasons, sir, that many soldiers rather look upon this question, interesting as it is, as of academic than of practical interest, and why we are most anxious to know from Major Stone, if he is able to tell us, what means there are for adapting this elaborate—this carefully worked out—scheme of home defence to meet the very sudden emergencies of our military position abroad.

Major STONE: Lord William Seymour alluded to the incompleteness of the partial mobilization of the 9th Division, which recently took place at Ashdown Forest, as regards horses. He was able to give us the satisfactory assurance from the Inspector-General of Remounts that the horses were there if required, and of course he was well aware himself that the question was not merely the expense of mobilizing the necessary horses, but it also involved calling out, at all events, a proportion of the Reservists, in order to enable the different units to provide the drivers, &c., necessary for the purpose. A large increase in the establishment of horses, bringing a unit from a peace to a war establishment, must necessarily mean a corresponding increase in the number of men available to look after the horses and drive them. This, of which Lord William Seymour was well aware, may not have occurred to people in general, and it was very much regretted that this reason, just as much as the expense, was an absolute deterrent from pushing the matter any further. There is great reluctance to call out the Reservists except when absolutely necessary, for reasons too well known to require dilating upon, and this, added to the expense, completely put the stopper on trying to push the matter any further. Colonel Dooner bore most satisfactory testimony to the completeness of the Mobilization Regulations, which I am sure will be read with much pleasure by those who had the very laborious task of framing them. He then alluded to the case of both battalions of a regiment being abroad, stating that no arrangements appeared to be made for receiving Reservists on a larger scale than was already provided for in the case of regiments which had one battalion at home. The difficulty, at all events at present, appears to be a very real one. There is not the slightest doubt, if mobilization were to take place at this moment, that at two or three depôts, speaking from memory, because I am not quite sure how many regiments have both battalions abroad—I am told that it is six, which is somewhat above the normal number—they would be very hard pressed indeed as regards their staff when mobilization occurred. I do not think that any one who has not thoroughly thought out all the details in connection with the work which has to be done can have any conception of the strain which would, in such a case, be brought to bear upon our very limited staff. The peace-time staff in every district is cut down almost to starvation point, and when mobilization occurs, and an increased strain is brought to bear on that staff, it is only by every regimental officer being fully competent to run his own show without asking any questions that we can hope to get along with any satisfactory results. Of course, this particular case which Colonel Dooner alluded to is one which will involve very serious difficulties indeed, and I should be extremely sorry for the officer commanding the depôt who had to carry that work

out, because it certainly would be no joke. However, I believe that at the present time the authorities at the War Office and the Secretary of State for War are considering how best to arrange so as to have always one battalion at home and one battalion abroad in each regiment as originally intended by Lord Cardwell. What the exact state of the negotiation is at present I do not know. I hope the result will be that we shall have something very definite in a short time which will obviate the difficulty Colonel Dooner has raised. He next alluded to the lists of men being kept up during peace-time under what I described as mobilization within the unit—lists of men for various duties, such duties as it is well known beforehand will have to be carried out: various details, such as detachments for machine-gun sections, men for transport duty, men to go and fetch the horses from the centres, and so on, and in a few cases garrison artillery detachments who go abroad to colonial stations. Colonel Dooner appears to think, with his large experience, that this could not be kept up with the peace establishment of any unit as at present organized. In that I quite agree with him, but, owing to the necessity of cutting my paper as short as possible, I did not fully explain what I should have explained, namely, that it was not supposed for one moment that this could be done on the peace establishment of any existing unit, but these lists might be kept up in every commanding officer's orderly room, showing exactly what numerical strength and composition was required for each detail, and he would fill up that detail partly with men already serving, using his own judgment as to how many blanks he would leave to be filled up by Reserves when they joined. By adopting that means, when the Reserves came crowding in upon him he would be saved the trouble of creating an organization which could have been inaugurated in peace-time, and the men as they arrived could be fitted into their proper places. For instance, he would take men to drive horses, he would take half of them or perhaps less, according to his peace strength, from men who are already serving who are accustomed to transport duties generally; he would leave blanks for the remaining number, but he would have the number and composition of the non-commissioned officers and the number of men required actually down on the list, and while 1, 2, 3, 4, 5 would be men serving in the regiment at the time, 6, 7, 8, 9, 10 would be Reservists, and when the Reserves came out men would be selected to fill the vacancies who had some previous experience of similar duties while serving. Similarly, as to the machine-gun section, and mounted infantry, and all other details. With regard to detachments for abroad, which have been alluded to, the garrison artillery are called upon to provide a certain increment in garrisons for colonial stations, and these are all detailed in the mobilization tables. The officers commanding the units which have to furnish these details are required to keep up the roll of non-commissioned officers and men corrected up to date, ready to send these men off at a moment's notice, on mobilization, to Gibraltar, Malta, or whatever station they may be allotted to, their place being taken by Reservists when the Reserves join. Major Murray has raised a very large question indeed, and one which has been fought out on a great many platforms. At the beginning of my lecture, when I originally wrote it, I purposely put in a paragraph to the effect that I did not propose to enter upon this question, namely, "the command of the sea," which has been discussed so very many times, and with, I am afraid, rather barren results, though we have all received a great deal of information on the subject; at the same time I do not think it has anything to do with the question at issue. This is only a humble endeavour to explain existing regulations; therefore, I do not feel competent to start afresh what is practically a very old subject, and I hope that Major Murray will forgive me if I do not say anything more about it. With regard to the specific question that he asked, namely, whether the three army corps for home defence can be sent abroad with equipment and everything complete, that is a question which, even if I were fully capable of answering it (which I am not, for I could only answer it partially), I do not think it would be right for me in my position to say anything at all about. I do not think the Adjutant-General would approve of making questions of that sort public at present. When the authorities at the Horse Guards consider that it may be published, if they ever do think so, I suppose it will be published, but at all events it is scarcely competent for any officer who may know something about it from confidential sources to say anything about it in public. I

hope, therefore, Major Murray will pardon me if I give him no satisfaction at all.

Major MURRAY: My point was whether the one army corps was ready to go abroad, and not the other two.

Major STONE: I understand the point. The published distribution lists of the British Army up to the end of last year contained an actual detail of all the units which are allotted to the Ist Army Corps for service abroad, therefore there is nothing confidential in that. These troops were actually allotted, the various units for the Ist Army Corps, for the line of communications and the base. There was a large "I" put against their names, so that each could be identified by name, and the stores and equipment for one army corps were supposed to be more or less complete at convenient ports of embarkation and concentration. As regards camp equipment, there is not the slightest doubt that there is sufficient camp equipment for a corps. However, at the beginning of this year the form of the distribution list was changed. There was a table called the M.I. table, which was published, containing a complete detail of the troops of the Ist Army Corps, line of communications, and base for service abroad, which I think was a confidential table, but I am not quite certain, issued to General Officers commanding districts, and lists of alterations were published so as to keep it up to date whenever alterations occurred. At the beginning of this year the form of table was altered, and the M.I. table has for some time ceased to exist. It is about to be supplemented by a table, which I alluded to, called the "Table for the Field Force for Service Abroad." It is not yet published, but I saw it this morning, and whenever sanction is given for its publication it will be published in the Army Orders. I have given a full detail of a division which is kept ready in all respects for foreign service as the advanced troops of the Ist Army Corps. Further than that I am afraid I could not go.

Colonel WALFORD: I am sure you will all agree with me when I propose a vote of hearty thanks to Major Stone for his most interesting lecture.

FOREIGN SECTION.

THE FRENCH NAVAL MANŒUVRES OF 1893.

Prepared by permission from the special correspondence of the "Temps," and from the "Marine de France" and other sources. By Commander H. GARBETT, R.N.

THE French Naval Manœuvres were carried out as usual both in the Mediterranean and the Channel. Last year the object of the manœuvres was to test the efficiency of the coast-defences; this year the themes were chosen with a view of exercising the cruisers in scouting, keeping touch with an enemy, and transmitting intelligence.

Composition of the Evolutionary Fleet in the Mediterranean.

The Evolutionary Fleet was formed of the Active and Reserve Squadrons under the command of Vice-Admirals Vignes and de Boissoudy respectively; Vice-Admiral Vignes being in supreme command.

Active Squadron:—

1st Division.—Battle-ships: "Formidable," flagship of the Commander-in-Chief, "Courbet," "Redoutable."
1st class battery cruiser: "Cécile."
Torpedo-cruisers: "Faucon," "Vautour."
Torpedo-aviso: "Léger."
Torpilleurs-de-haute-mer: "Audacieux," "Ouragan."

2nd Division.—Battle-ships: "Hoche," flag-ship of Rear-Admiral Le Bourgeois, "Amiral Baudin," "Amiral Duperré."
1st class barbette-cruiser: "Alger."
3rd class cruiser: "Lalande."
Torpedo-aviso: "Lévrier."
Torpilleurs-de-haute-mer: "Téméraire" and "Coureur."

3rd Division.—Battle-ships: "Dévastation," flag-ship of Rear-Admiral Gadaud, "Neptune," and "Marceau."
2nd class barbette-cruiser: "Davout."
3rd " " "Troude" and "Cosmao."
Torpedo-cruiser: "Wattignies."
Torpedo-aviso: "Bombe."
Torpilleurs-de-haute-mer: "Kabyle" and "Dragon."

Reserve Squadron.

1st Division.—Battle-ships: "Richelieu," flag-ship of Commander-in-Chief.
Battle-ships (coast-defence): "Caïman," "Terrible."
1st class battery-cruiser: "Tage."
3rd class barbette-cruiser: "Forbin."
Torpedo-cruiser: "Condor."
Torpilleurs-de-haute-mer: "Orage," "Éclair."

2nd Division.—Battle-ship: "Colbert," flag-ship of Rear-Admiral Prouhet.
Battle-ship (coast-defence): "Indomptable."
3rd class barbette-cruiser: "Milan."
Torpedo-avisos: "Flèche," "Dague," "Dragon."
Torpilleurs-de-haute-mer: "Aventurier," "Agile."

To these must be added the armoured gunboats "Fusée" and "Mitraille," and the 15 torpedo-boats, forming the Défense Mobile of Toulon, under the command of Capitaine-de-frégate de Bonifay, which were placed under the orders of Vice-Admiral de Boissoudy, and the 17 torpedo-boats of the Défense Mobile of Corsica and Algiers, which were attached to Vice-Admiral Vignes's squadron. The transport "Gironde" was also specially commissioned and manned by Reservists to act as a depôt ship for the Toulon torpedo-flotilla.

From the 1st July to the 10th, the fleets proceeded on a preliminary cruise, which was devoted to steam tactics, scouting, signalling at long distances, and torpedo-boat attacks; of these last only three call for any special notice. The first was made on the night of the 5th upon the Active Squadron, which was anchored in the Gulf of Juan, and the second during the following night on the Reserve Squadron, which was anchored off Villefranche. The object in each case was to show whether it was possible for a squadron, obliged to anchor in an open roadstead, to create round itself a fixed zone of light, thrown from the search light, through which no torpedo-boat could pass without being discovered, and which would thus form an effectual protection. Each ship was directed to illumine a certain section of the anchorage, while the picket-boats were stationed to watch any dead angles. All the torpedo-boats were discovered as soon as they entered the limits of the zone, that is, at a distance of some 2,000 yards. The last attack was made on the fleet at sea on the night of the 7th, the Commander-in-Chief wishing to ascertain whether the torpedo-boats would have much difficulty in discovering a large squadron in the darkness, and, on the other hand, whether the scouts of the fleet would succeed in discovering and intercepting their attack. The squadron stood out into the offing in the evening, leaving the light ships in shore on the look-out, either to stop the torpedo-boats or lead them astray. The torpedo-boats were grouped, two at Agay and five at Antibes; they weighed at 8 P.M., having received from

the semaphores the exact position where the ships were last seen. At the time the fleet was only some 15 miles from the shore. After dark the ships proceeded without lights, the Admiral steering a zig-zag course, first towards and then away from the land, the ships being in two columns in line ahead, and thus covering a great deal of ground. The torpedo-boat from Agay was discovered by the cruisers and destroyed, but the others slipped through the cordon and safely gained the offing about 9·30 P.M.; they then spread like a fan, and soon succeeded in getting in touch of the squadron. They were discovered, and the ships opened fire, but, it is stated, very much at random and recklessly with regard to the positions of each other, so that there is little doubt but that one or more would have been successfully torpedoed. On the 10th the ships returned to Toulon to coal and prepare for the grand manœuvres, which were to follow.

Instructions and Themes.

The following is a *précis* of the Instructions issued by the Minister of Marine:—

"Manœuvres will be carried out between the 17th and 28th July by the Active and Reserve Squadrons, with the addition of the vessels commissioned at Toulon for the purpose and the Défenses Mobiles of the 5th Arrondissement, Corsica and Algeria. They will include:—

"1st. Manœuvres of double action.
"2nd. Manœuvres of simple action.
"3rd. Engagement at sea between the two squadrons.

1. *Manœuvres of Double Action.*

"*Position of the Squadrons.*—Two hostile fleets represented by the Active and Reserve Squadrons, knowing each other's strength and position, are ready to take the sea 48 hours after the declaration of war.

"The first (the Reserve Squadron) is stationed at the Hyères Islands. The anchorage which it occupies is supposed to be defended by submarine mines, which protect it from being rammed by the enemy's ships.

"These mine-fields block all the accessible channels to ships of large tonnage, from Jaune-Garde to Grand-Ribaud, from Gros-Seraignet to Titan, from Titan to Cape Bénat. Moreover the coast-batteries are supposed to prevent any enemy approaching within 4,000 yards.

"The Reserve Squadron has also at its disposal the armoured gunboats and torpedo-boat flotilla at Toulon, as well as the transport 'Gironde,' and is supported by all the coast-defences between the 2nd degree E. and the Italian frontier, besides being able to use all the semaphores and signal stations of that part of the coast.

"The second fleet (the Active Squadron) is anchored in the roadstead of Ajaccio; it has at its disposal the torpedo-boats attached to Algiers and Corsica, and the support of the fixed defences

of Corsica and of the African coast comprised between the meridians of 2° E. and 8° 30′ E. (from Bougie to Cape Bon), and also the use of the semaphores and signal stations of Corsica and Algeria, as well as the cable connecting Bone with Corsica.

"The rest of the Mediterranean littoral to be considered neutral territory, and the belligerent forces not to make use of any of the ports unless absolutely compelled by necessity.

"*The Rôle assigned to each Squadron.*—The duty assigned to the Reserve Squadron is to dispatch one of its divisions to sea, which will do its best to elude a division of the Active Squadron sent to intercept it, which division is superior both in force and in speed, and then to attempt an attack on any point of the enemy's coast within the limits already mentioned. Moreover, it cannot go outside the zone comprised between the meridians mentioned above, in order to avoid the pursuit of the enemy.

"The *rôle* of the Active Squadron is to defend the coasts of Corsica and Algeria within the limits fixed. For this purpose it will watch the squadron of the Reserve at its anchorage, and will detach one of its divisions in pursuit of the enemy, in order to foil its attacks, and, if possible, as it is stronger, destroy it.

"*Time of the Manœuvres.*—War will be declared at noon on the 17th July. The two squadrons to have taken up their appointed stations by that date.

"For 48 hours, from mid-day on Monday, the 17th, to noon on Wednesday, 19th, the battle-ships of the two squadrons are to take the necessary measures for protecting themselves at their anchorage against the attack of torpedo-boats.

"The battle-ship of the Active Squadron, bearing the flag of the officer to whom has been entrusted the duty of taking charge of and directing the movements of the scouting vessels of the squadron, and the light vessels of both squadrons are at liberty to move at noon on the 17th.

"At noon on the 19th the battle-ships of the two squadrons are supposed to be ready to put to sea; but the division of the Active Squadron, to which the duty of chasing the enemy is assigned, is not to quit Ajaccio until the information has been signalled by the scouts that the enemy's ships have put to sea from the anchorage at the Hyères Islands.

"*Conclusion of the Operations.*—The operations will come to an end, should an action take place between the two divisions, or, in the event of their not meeting, at noon on the 28th.

"The division of the Reserve Squadron will only be considered as having been successful in any attack it may make on the coast, if it can maintain its position off any place for a space of six hours within bombarding distance: this distance is fixed at 8,000 yards."

To Rear-Admiral Prouhet, who had under his orders all the cruisers of the Reserve Squadron, and an ironclad division, composed of the "Colbert" (flag), "Terrible," and "Indomptable," was entrusted the task of making the raid against the Algerian or Corsican coasts.

To Rear-Admiral Gadaud, in the "Dévastation," was assigned the duty of observing the movements of the enemy at Hyères; he had under his orders all the cruisers of the Active Squadron, with which to watch the three exits from that anchorage, and by means of a chain (extended over a distance of some 140 miles) to transmit the intelligence of the enemy's departure to the Corsican semaphores, and such other information as to his movements as would enable Rear-Admiral Le Bourgeois with his division, comprising the "Hoche" (flag), "Neptune," and "Marceau," on his leaving Ajaccio, to fall upon him before he could effect his object.

The ships of both combatants in these operations were allowed to steam, when circumstances required it, at $\frac{8}{10}$ of the maximum power which was developed at their trials.

Neither Vice-Admiral Vignes nor Vice-Admiral de Boissoudy took any actual part in the operations, and their flag-ships were neutralized; Vice-Admiral Vignes acted as Umpire-in-chief, and followed the operations at sea; while Vice-Admiral de Boissoudy acted as Umpire for the operations which were being carried on at the same time by the other ships of the two fleets, according to the following scheme.

2. *The Manœuvres of Simple Action.*

While the first theme of the manœuvres was being carried out as detailed above, the remaining battle-ships of the two squadrons were employed in carrying out operations of quite a different character, in which both in turn assumed the *rôle* of assailant.

The following was the theme indicated: "A squadron of battle-ships is compelled, in order to make good some necessary repairs, to anchor in an open roadstead, where the ships are, however, protected by mines and the coast forts from being rammed at anchor, but are exposed to bombardment and attacks from the enemy's torpedo-boats. The object of the enemy, after reconnoitring the position of his opponent with his battle-ships, having no cruisers with him, will be to bombard and attack him with his torpedo-boats if an opportunity presents itself, but to withdraw in the evening, so as to avoid being attacked himself by the torpedo-boats of the other side. The duty of the commander of the anchored ships is to repel the hostile torpedo-boats, and at the same time to follow the movements of the enemy with his own, which are to attempt to keep touch with and attack the hostile ships during the night following their appearance on the coast."

The attack was first made by a division of four battle-ships of the Active Squadron, viz., the "Courbet," "Redoutable," "Amiral Baudin," and "Amiral Duperré," and the torpedo-boats of the squadron and Défense Mobile of Corsica, the whole under the command of Capitaine-de-vaisseau Chateauminois of the "Courbet"; this division in its turn selected an anchorage in Corsica, where the other squadron, consisting of the "Caïman" and the "Gironde," which for the occasion was considered a battle-ship, and the armoured gunboats and torpedo-boats of the 5th Arrondissement, under the

command of Capitaine-de-vaisseau Forêt of the "Caïman," attempted the same operation. Vice-Admiral de Boissoudy, as already stated, acted as Umpire for these operations.

The third part of the manœuvres, which was carried out by the whole of both squadrons, may be called evolutionary, consisting as it did in both fleets engaging each other under different conditions, and does not call for any special comment.

The following are the principal orders issued by Vice-Admiral Vignes, and are interesting, when compared with the rules governing English ships during the manœuvres:—

A. *Regulations for Squadrons or Groups of Ships Engaging each other.*

When the execution of the manœuvres renders it necessary for squadrons or subdivisions of squadrons to pass each other, the following rules are to be adhered to:—

Although line ahead may not appear to be the best order of battle, yet this formation is to be adopted.

In other orders of battle, which commanders of squadrons have considered as more convenient, it is impossible to foresee with any certainty the conditions under which different ships may pass each other, or the confusion which may ensue. However interesting they may be as a matter of experiment, it is better to give them up in order to ensure the guarantee of safety which prudence enjoins should govern manœuvres in time of peace, and to avoid the risks of collision which, in time of war, would be the principal objective.

Passing in line ahead, if it does not present anything of interest, will serve to bring out the advantages or the reverse of this order of battle.

Before passing each other, therefore, the squadrons and groups of ships are to be formed in line ahead (either indented or otherwise).

They will pass broadside to broadside at a distance which is not to be less than 600 yds. Each squadron or group manœuvring according to the orders of its chief in such a manner as to leave in every case the squadron or group opposed to it on the port hand.

The same rule will be carried out by single ships.

The light cruisers are to form in the order and at the distance from their squadron indicated in advance or signalled by the commander of the squadron. They are to be ready either to chase or engage similar ships of the enemy, or to approach, if judged necessary, either to take possession of an enemy's ship, or to assist one of their own. The torpedo-boats are to take station on the off-side from the enemy under the cover of the battle-ship to which they are attached, ready to take advantage of any opening for discharging their torpedoes.

Ships will be ready to open fire when at a distance of 3,000 yds. from the enemy.

Fire will be continued while passing as long as an enemy's ship is in the field of fire, proper time being taken for loading and training.

The fire of the heavy guns is to be regulated so as to ensure their being brought to bear at the nearest point when crossing.

The number of rounds fired by each gun, including the light pieces, is to be noted exactly, also the ships at which they were fired, in order to be able to ascertain, from their position in the line, the ships which have suffered most when passing under these conditions.

B. *Fighting Value of the different Ships, with the Maximum Number of Revolutions allowed.*

Active squadron.			Reserve squadron.		
	Fighting value.	Revolutions.		Fighting value.	Revolutions.
Formidable	36	64	Richelieu	29	67
Courbet	35	68	Colbert	28	52
Redoutable	30	58	Caïman	25	72
Hoche	36	67	Indomptable	25	73
Neptune	36	71	Terrible	25	72
Amiral Duperré	34	60	Tage	21	74
Marceau	36	71	Forbin	8	104
Amiral Baudin	36	61	Milan	4	121
Dévastation	35	63	Condor	7	109
Cécile	21	83	Flèche	2	263
Alger	16	93	Dague		
Davout	13	106	Dragonne		
Cosmao	8	104			
Troude					
Lalande					
Faucon	7	109			
Vautour					
Wattignies	7	112			
Léger	3	250			
Lévrier					
Bombe	2	263			

The torpilleurs-de-haute-mer had no fighting values assigned to them.

C. *Rules with regard to Fighting.*

1. In every engagement the superiority to belong to the ship or squadron possessing the greatest number of points as laid down in the table.

2. Ships are always supposed to be in action when within 3,000 yds. of each other.

3. The issue of an action will be regulated by the following rules:—

a. Every single ship having an action with a superior adversary to be considered as destroyed or captured; but the ship or ships which are the victors are to be considered as having herself or themselves lost fighting value to the extent of one-third of the points represented by their opponent.

In the case of several ships being concerned in such an action, this

loss will be taken off the strongest ship. In subsequent engagements, the ship whose value has been so modified is to hoist a signal giving her actual fighting value at the time.

b. When two groups of vessels are engaged, the weakest will be considered as destroyed if the sum of the points representing the respective forces of the two adversaries are in the relation of more than 3 to 2; if less than this proportion, the weaker side will lose its strongest, and the stronger its weakest ship. (In the case, however, of an action between the ironclad divisions commanded by Rear-Admirals Le Bourgeois and Prouhet respectively, such action, in view of the superiority assigned to the first-named, is to be considered decisive, and these divisions at its conclusion are to return to the anchorage off the Hyères Islands.)

c. Every battle-ship, cruiser, or torpedo-cruiser which shall have been torpedoed four times from a distance of less than 400 m. without having perceived or fired upon her assailant, is to be considered as destroyed.

4. In every engagement the result will only be considered as decisive and the above rules as applicable, if the ships engage under the following conditions:—

a. If a battle-ship or cruiser remain by day for 20 mins. within at least 3,000 m. of its adversary, or passes broadside to broadside within less than 1,000 m. By night, if the weaker ship has been under the search light for the same time.

b. If a battle-ship or cruiser keeps a torpedo-boat under its fire for 90 secs. at less than 2,000 m. by day, or under the search light for 1 min. at night. This time will be doubled in the case of torpedo-cruisers, and tripled for torpedo-avisos.

c. If torpedo-boats discharge their torpedo at any ship within a distance of 400 m. without being perceived or having fire opened upon them.

5. Every ship destroyed or captured is to immediately drop out of action and proceed to the anchorage at Hyères Islands until the conclusion of the manœuvres.

No torpedo-boat will be allowed to be considered as discharging a torpedo over the number it has in its tubes. When these have been fired it can take no further part in an attack until receiving a fresh supply, either from a battle-ship or torpedo-depôt.

Then follow certain regulations with regard to the flags to be hoisted and the lights to be shown, to mark the result of any engagement. After an engagement, the opposing groups of vessels were to steam severally 30 miles in diametrically opposite directions, the weaker side choosing the course.

In the series of operations at simple action (the second phase of the manœuvres) certain torpedo-boats, playing the *rôle* of torpedo-catchers, were given equivalent points to the "Bombe."

Each catcher was to be considered inferior to 4 torpedo-boats; she would endeavour to escape, and would be considered as destroyed if under their fire for five minutes at less than 1,000 m.

Every ship was to keep a special journal, in which the most ample details were to be entered of all incidents which affected not only the ship herself, but which might be witnessed from her during the operations. This journal was to be accompanied by a chart, on which all the courses steered when detached from the squadron, or when acting as leader of a squadron, were to be shown.

It will be shown from the above, that not only was the fighting value of each ship thus determined, but her maximum speed also laid down by the highest number of revolutions being specified which her engines might make. The regulations by which ships or torpedo-boats put out of action were debarred from taking any further part in the operations, seem to be more sensible than the 48 hour rule which is the custom in the English manœuvres, certainly so far as torpedo-boats are concerned; while the striking off of so many points of fighting value from ships which have been in action, is also a regulation which seems to be dictated by common sense.

The Operations.

In accordance with the instructions, the Active Squadron proceeded to Ajaccio, where it arrived on July 17, while the Reserve Squadron steamed to Hyères, where it anchored early in the morning of the same day. This roadstead of Hyères is an anchorage of great importance, from its vicinity to Toulon; although that harbour and arsenal are so strongly fortified as to render any attack upon it from the sea almost hopeless, yet it might be endangered if an enemy obtained possession of the splendid roadstead which is formed by the Hyères Islands, the peninsula of Giens and Cape Bénat. With a view of rendering the anchorage impregnable, the Government last year acquired the island of Levant, one of the groups where the construction of extensive works has been taken in hand. The usual anchorage is off Salins, but ships are there visible from the sea, so on this occasion Vice-Admiral de Boissoudy anchored his squadron off Porquerolles, a part of the roadstead where ships can lie quite concealed from vessels in the offing.

On the 18th, at 5 P.M., Rear-Admiral Gadaud, in the "Dévastation," with his squadron of cruisers, left Ajaccio to observe the enemy's movements. There are three channels by which ships can leave or enter Hyères roads; the largest, the grand pass between Porquerolles and the fortified island of Bagaud, is 5 miles wide, but between Bagaud and Port-Cros the channel is only 600 yds. wide, while the third, between Titan and Levant islands, the east of the Archipelago, is rather more than half a mile in width.

The following dispositions were made by Admiral Gadaud to watch the passes, and keep up his communications with the main body of the fleet at Ajaccio. The cruisers were divided into eight groups:—

Group A.—"Cécile," "Léger," "Téméraire," and a torpedo-boat of the Défense Mobile of Corsica, under the command of Capitaine-de-vaisseau Lornier.

Group B.—"Davout," "Bombe," "Ouragan," and a torpedo-boat of the Défense Mobile of Corsica, under the command of Capitaine-de-vaisseau Bernardières.

Group C.—"Alger," "Lévrier," "Coureur," and a torpedo-boat under the command of Capitaine-de-vaisseau Jauréguiberry. These three groups formed the head of the line of scouts to watch the passes, and when concentrated were designed to be superior in strength to the enemy's combined cruisers.

Group D.—"Cosmao" and a torpedo-boat, placed in a central position, to act as a support to either of the three preceding groups as necessary.

Group E.—The central point and *point d'appui* of the scouting squadron, "Dévastation" (flag), "Wattignies," and torpilleurs-de-haute-mer "Kabyle" and "Dragon."

The three remaining groups were to act as the posts for transmission of intelligence.

Post F.—"Lalande," "Troude," and "Vautour," under the command of Capitaine-de-frégate Barnaud. Post G.—"Faucon." Post H.—"Audacieux."

The following positions were taken up by the different groups on their arrival off the enemy's anchorage:—

Group A.—6 miles S.E. of Gubinière, to watch the passes between Titan lighthouse and Gros-Seraignet.
Group B.—8 miles E. of Titan light, to watch between Titan light and Cape Camarat.
Group C.—7 miles S. of Grand-Ribaud, to watch from Gros-Seraignet to Fourmigues, on the Gulf of Giens.
Group D.—4 miles S. 57° E. of Group A.
Group E.—20 „ „ „ „
Group F.—60 „ „ „ „
Group G.—100 „ „ „ „
Group H.—In sight of the semaphore on Sanguinaires and the squadron off Ajaccio.

The limits given above for Groups A, B, and C to watch, were those within which each group was to pay special attention; at the same time each commander was not to hesitate to move into the section of a neighbouring group, if he observed anything suspicious, or to go to the assistance of a neighbouring ship, if attacked by superior forces, but in this case he was to leave the torpedo-aviso and torpedo-boat attached to him to watch his section.

Every group or vessel obliged to retreat before superior force was ordered to try and manœuvre in such a manner as to fall back on a neighbouring group, remaining as near as possible to the station assigned to it.

If Group D was called upon to render assistance to the other groups, the commander was to detach his torpedo-boat to convey the intelligence to Admiral Gadaud, and in the event of the latter finding it necessary to proceed to the assistance of his cruisers, he was to leave the "Wattignies" and one of his torpedo-boats behind him. For the

transmission of intelligence, he would detach the "Wattignies" 5 miles N. 57° W., and the "Kabyle" the same distance in the opposite direction. The "Dragon" to convey the news to Ajaccio of the sortie of Admiral Prouhet and his division.

Group F.—Distributed as follows: the Commander at the centre point of station; one of the cruisers 10 miles N. 57° W. from this point and the other S. 57° E. In the event of the enemy appearing in force, they were to fall back on the central group.

Group G.—The "Faucon" would, if the weather was fine, station herself 15 miles from the Sanguinaires in the scouting line. If the enemy appeared in force, to fall back on the coast of Corsica.

Group H.—The "Audacieux" to take up station in the Gulf of Ajaccio, so as to be in a position to transmit to the squadron the signals made by the semaphore at Sanguinaires.

The cruisers were recommended not to remain stationary during the night, but to keep moving in a small circle and ready to proceed full speed at any moment.

All the signals from the head and reinforcing groups were to be repeated to Admiral Gadaud. The signal indicating the departure of Admiral Prouhet was to be passed along to Ajaccio as rapidly as possible in the following manner: the group which discovered the departure of the enemy was to immediately despatch one of its light vessels in the direction of the "Cosmao," which ship would send her torpedo-boat to transmit the news to the "Dévastation" or ship in advance of her. The signal would then be passed from group to group along the line of scouts, each vessel advancing, until the signal could be perceived by the scout next on the line to Ajaccio. In addition, Admiral Gadaud was to despatch the "Dragon" or some other vessel to convey the news to Ajaccio, this estafette to make the land 30 miles N. 57° W. of the Sanguinaires, where it should meet the division of Admiral Le Bourgeois, proceeding to Ajaccio if it failed to meet this division before arriving there.

The following orders were issued for the guidance of the cruisers after the enemy's division had left its anchorage:—

"On the putting to sea of the enemy, the cruisers employed in blockading the islands are to form in such a manner as to be a scouting line for Admiral Le Bourgeois.

"The group observing the enemy's departure is to keep touch with him, avoiding the attacks of his cruisers.

"Group E ('Dévastation') will steam as rapidly as possible to gain touch with the enemy, which it should not lose. The 'scouting head' will then be composed of Group E and one of the three groups A, B, or C, and will be superior in force to the enemy's cruisers, so that it need not fear being driven by them out of sight of the ironclads.

"Admiral Gadaud will have at his disposal eight cruisers, without counting the 'Faucon,' for transmitting information; the 'Faucon' will be stationed at a point 30 miles N. 57° W. from the Sanguinaires, which will serve as the pivot of the scouting line during the movements in pursuit of Admiral Prouhet.

"The eight cruisers, on quitting the position they occupied during the blockade, will be écheloned along the line, between the 'Faucon' and the head of the scouting division, keeping within sight of each other by day and of the electric search light by night. The torpedo-boats will at the same time group round the 'Dévastation,' whence Admiral Gadaud will despatch them singly or in twos along the line of cruisers, with orders or information to be transmitted to Admiral Le Bourgeois.

"Admiral Le Bourgeois will weigh with his division as soon as the news arrives of the departure of Admiral Prouhet, and he will steer first to the N.W. until he meets the 'Faucon' and receives from her the latest reports as to the course steered by the enemy."

On the 19th, at 6 P.M., Admiral Prouhet weighed with his division and, proceeding through the small channel, shaped his course south from Cape Sicié; it does not seem clear why he weighed thus in broad daylight, for, of course, he was immediately observed, and the information was signalled from group to group of the watching scouts, arriving at Ajaccio at 10 P.M.; it thus took $3\frac{1}{2}$ hours to cover 120 miles, the first signal having been made by the "Cécile" at 6.30. At 7.40 P.M., as dusk was coming on, the enemy was sighted from the "Dévastation," steering south with his cruisers on his port hand, which he had formed into a single squadron under the command of Capitaine-de-vaisseau Mallarmé of the "Tage."

At 10 P.M. a great display of search lights was observed, evidently from some of the enemy's ships, which ought to have made Admiral Gadaud suspicious; however, the course of the "Dévastation" and squadron was altered to close with them, when the "Tage," "Milan," and "Forbin" were brought into view by the projectors, but nothing could be seen of the battle-ships. At 11 P.M. the Admiral signalled the "Léger" to proceed ahead and reconnoitre; she returned soon after midnight reporting that she could see nothing but the cruisers, so course was now altered first to the S.E. and then to N.E. At 7.20 A.M. on the 20th several green lights were observed to the east, but no notice appears to have been taken of them, and when daylight came, only the enemy's cruisers were in sight in the distance. At 5.30 the "Cécile" hove in sight; she had also lost sight of the enemy's battle-ships, and was again ordered to chase, but it was clear Admiral Gadaud had been outwitted, and that the task of keeping touch with the enemy's ironclads, and at the same time with Admiral Le Bourgeois's squadron at Ajaccio, had failed, that the scouting arrangement had broken down, and the scouting vessels had become disorganized. In the meantime, on the arrival of the "Dragon" at 2 A.M., Admiral Le Bourgeois had weighed with his squadron and put to sea, and steered towards Cape Corso, it having been signalled to him by some mistake that the enemy was proceeding in that direction, and at 8 A.M. he effected his junction with Admiral Gadaud, and course was shaped N.E.; in the afternoon he directed his squadron to cruise between Cape Corso and Capraja, while the Gadaud division was extended to again scout in a line 60 miles on the parallel of Cavallo semaphore.

Nothing happened during the day and following night, but it turned out afterwards that the "Alger," which had separated from the rest of the fleet, had been chased by the "Tage" and "Forbin" and captured. While these movements, resulting in nothing, had been carried out by the defending fleet, Admiral Prouhet with his division of battle-ships, having shaken off the hostile cruisers, had continued his course during the night to the south; but at daybreak he unexpectedly came across the "Davout," escorted by the "Bombe" and two torpedo-boats; he does not seem to have made any attempt to cut off these vessels, but continued his course during the day to the southward, but having observed that the "Davout" had sent off, one after the other, both the "Bombe" and the two torpedo-boats, he seems to have imagined that his opponents would be on his track towards the Algerian coast; so, when night fell, he turned to the east again, intending to operate against the Corsican coast, which he imagined to be undefended; as it happened, if he had continued his route to Algeria he might have ravaged the coast without interruption; but the fortunate mistake, as it proved for the defenders, which sent Admiral Le Bourgeois to cruise off Cape Corso, and the fact that the "Davout," in spite of the change of course, managed to keep touch with her opponents during the ensuing night, frustrated Admiral Prouhet's plans and brought about his defeat. The next morning (the 21st) the "Wattignies," "Léger," and two torpedo-boats sighted the "Davout," and the information was speedily transmitted to Admiral Le Bourgeois of the position and course which was being steered by the enemy; the Admiral proceeded immediately, full speed, with his division to the S.W., and came up with Admiral Prouhet as he was about to attack the coast in the vicinity of Propriano. According to the rules laid down, Admiral Prouhet was thus defeated.

While these operations were going on, the remaining divisions of the two fleets were engaged in the manœuvres of "simple action," which have already been sufficiently described.

In each attack the attacking force seems to have withdrawn successfully when night fell, the torpedo-boats of neither side succeeding in finding and attacking the enemy during the night.

It is not necessary either to dwell upon the scouting and the action at sea, under different conditions, which formed the third part of the manœuvres, as no features of special interest were presented by any of the evolutions which took place.

On the 8th August, however, some interesting target practice was carried out; as many modern forts are erected on lofty eminences, it was considered advisable that the vessels should have some practical experience at firing at such elevated objects with their heavy guns. The place chosen for the operation was the Gulf of Porto, on the west coast of Corsica, and the target was the summit of Cape Rosso, which forms the southern limit of the Gulf. The "Cosmao" was sent to a position where she could observe the results. The vessels taking part in the firing were the "Formidable," "Courbet," "Redoutable," "Hoche," "Amiral Duperré," and "Dévastation."

The distance was 8,000 m., and the speed of the ships 10 knots. In the first firing only the "Formidable," with her 6·2-in., and the "Hoche" and "Courbet," with their 5·5-in. guns, took part. Then all six battle-ships, steaming at 8 knots, fired at a range of 3,500 m., using all their guns. Next the "Duperré," steaming slowly, fired at a range of 1,000 m. On each of these occasions the ships steamed ahead on a prescribed course. Finally, the "Formidable," "Hoche," and "Courbet," steaming at 10 knots on an arc of a circle, of which the target, at a distance of 8,000 m., was the centre, fired once more. The "Formidable" fired 12 rounds from her 16-cm. guns and 60 rounds from her 14-cm. guns; the "Courbet" and "Hoche" 60 rounds from their 14-cm. guns; the "Redoutable" and "Dévastation" 18 rounds from their 14-cm. guns; and the "Amiral Duperré" 15 rounds. The results are said to have been very satisfactory. Before the fleet returned to Toulon for the final inspections, a night attack was carried out against the battle-ship "Neptune," escorted by the "Bombe," "Kabyle," and "Ouragan," by the torpedo-boats of the Défense Mobile, under the command of Capitaine-de-frégate de Bonifay, supported by the avisos "Léger" and "Lévrier."

The Active and Reserve Squadrons anchored in Toulon roads on August 14th, and then proceeded to the Gulf of Juan for the general inspection, which always brings the manœuvres to a close.

Admiral Vignes issued an order of the day, in which he thanked Vice-Admiral de Boissoudy, the Rear-Admirals, captains, and officers in command of ships, for the hearty co-operation he had experienced from them, and also complimented the officers and men on the general state of efficiency of the ships and the manner in which all the exercises had been carried out.

The Manœuvres in the Channel.

As has now become the rule, the manœuvres coincided with the period for calling out the Reservists. These ought all to have arrived at Brest and Cherbourg by the 10th July, but complaints, apparently well founded, have been made that a good third of the men did not put in an appearance until many days later, and that many even had not turned up by the 1st August. Nevertheless, the vessels mobilized had all arrived from Brest or taken up their places in the outer roads at Cherbourg between the 11th and 16th July. The 1st class torpedo-boats in the Reserve at Cherbourg all received their crews complete at once, so that they were able to proceed on some preliminary cruises for exercise and firing their torpedoes. On the 15th, in the morning, these vessels left to take up their appointed stations on the coast; they were under the command of Capitaine-de-frégate Leroy, Commander of the Défense Mobile, who was on board the torpilleur-de-haute-mer "Zouave." The same evening four 2nd class boats, detached from Brest, arrived to reinforce the flotilla.

To guard the coast-line of the 1st Arrondissement Maritime (about 270 miles of coast), there were then for disposal:—

3 torpedo-boats of the Défense Mobile of Dunkirk.
6 „ „ „ „ Cherbourg.
4 „ „ „ „ Brest.
7 „ mobilized at Cherbourg.

To these 20 vessels must be added the "Zouave" and the armoured gun-vessel "Flamme," also belonging to the Défense Mobile of Dunkirk.

In principle, all these vessels were divided into three flotillas, each comprising two divisions or groups of three or four units, the centres of each flotilla being Dunkirk, Havre, and Cherbourg; but in reality, on the outbreak of hostilities, the Dunkirk torpedo-boats were patrolling between Calais and Boulogne; at the same time the Havre flotilla detached two torpedo-boats to watch the coast between Havre and the mouth of the Somme. Then a division of the boats remained at Cherbourg and accompanied Squadron B, when it left for Havre on the 22nd July.

Composition of Manœuvre Fleet, Fighting Values, &c.

	Fighting value.	Maximum No. of revolutions.	Speed corresp.
Squadron A. Commanded by Rear-Admiral Barrera.			
Battle-ships—"Victorieuse" (flag)	30	62·5	9
„ „ coast defence—"Furieux"	70	68	10·6
"Tonnerre"	35	47	10·2
1st class barbette-cruiser—"Isly"	25	91	14
Torpedo-cruiser—"Épervier"	12	104	18·6
Torpilleurs-de-haute-mer—"Turco," "Grenadier"	0	255	17·6
		296	19·6
"Grondeur"	0	420	19·2
Squadron B. Commanded by Vice-Admiral Lefèvre.			
Battle-ships—"Suffren"	45	51	9·8
„ „ coast defence—"Requin"	100	75	12·6
"Fulminant"	35	58	10
3rd class barbette-cruisers—"Surcouf"	15	107	16·3
"Éclaireur"	10	79	10
Torpedo-avisos—"Lance," "Salve"	6	251	14
	6	248	14
Torpilleurs-de-haute-mer—"Défi"	0	420	19
"Véloce"	0	246	16
"Lancier"	0	325	23

The protection of the coast was completed by the mobilization of a certain number of the semaphore stations, which had their personnel

placed on a war footing. The most important of these were La Hague, Barfleur, La Hogue, La Hève, Cape d'Ailly, Alprech, and Grisnez; these stations were to keep a strict look-out, day and night, while those stations which had not been mobilized were to look out from daybreak to dark.

Fortified harbours: Calais, 70; Boulogne, 80; Le Havre, 80; La Hogue, 70; Cherbourg, 300. The importance of the last coefficient did not exclude a demonstration against that fortress, as, on account of the extent of the sea front, the assailant could choose a position of attack where he would only come under the fire of a portion of the works; and, from the point of view of the discussion of the operations, this would constitute an offensive demonstration, which would not involve the application of the whole coefficient.

The Programme and Theme of the Manœuvres.

The manœuvres in the Channel had for their object the study of the conditions under which an attacking squadron coming from the north could force the Straits of Calais. In effect, the operations were of a nature to determine:

1st. The numbers and types of ships necessary for the defending force, to enable it to be kept informed of all the movements of the enemy.

2nd. The best position for the squadron to occupy, from which the principal operations of the enemy can be most effectually checked.

The Theme of the Manœuvres, as issued from the Ministry of Marine.

"A French squadron is lying at Cherbourg, ready to put to sea as soon as the entry of an enemy's squadron into the Straits of Calais shall have been signalled.

"The surveillance of the Straits has been organized from the declaration of war. The French squadron having received at Cherbourg the telegram from its scouts, announcing that the enemy is in sight, is to weigh immediately, to find and bring him to action.

"In moving upon the enemy, the squadron is to keep in constant communication with the shore, so as to receive, with the least delay possible, news of any attack made by the enemy on any point of the coast of the 1st Arrondissement Maritime.

"The *rôle* assigned to the enemy's squadron is to attempt to pass the Straits without being discovered, and then to ravage the French coast of the Channel, while avoiding a decisive action.

"The English coast to be considered neutral.

"The defending force has the support of the coast batteries, the semaphores, and all the forces which the Vice-Admiral the Maritime Prefect has at his disposal.

"The declaration of war will take place at noon on the 20th July, at which time the ships of the two squadrons are to be at the stations assigned to them.

"Hostilities will end on the 28th July at noon, and the manœuvres will comprise the execution of the theme arranged, under two

different conditions: in the first case, the enemy will force the Straits between 4 A.M. and 4 P.M.; in the second, between 10 P.M. and 2 A.M.

"The Commander of A Squadron can choose for himself whether his first attack should be made by day or night."

Orders issued by Rear-Admiral Barrera, Commanding the Attacking Squadron.

"Squadron A will weigh from the mouth of the Thames on the evening of the 21st, at an hour which will be signalled.

"The torpedo-boats will be coaled and stored before starting.

"Steam will be ready, so as to allow of each ship making easily the maximum number of revolutions allowed.

"The intention of the Admiral is to attempt the passage of the Straits of Calais during the night of the 21st and 22nd, passing, towards midnight, a line drawn between Cape Grisnez and the South Foreland.

"The squadron will be in line ahead, the ships sufficiently close to keep well in sight of the next ahead.

"The 'Isly,' accompanied by the 'Grondeur,' will lead the line.

"The 'Épervier' will be in rear.

"The speed will be that of the 'Victorieuse,' the revolutions of the engines being 62·5, or 45 of the 'Suffren.'

"As the great object of the squadron is to pass without being seen, no lights are to be shown, and no signal to be made unless absolutely necessary. The lights are, however, to be kept in readiness, in case it is necessary to show them to avoid collision.

"The squadron will be before Boulogne at daylight. It will cruise before that town for a given number of hours, feigning a bombardment. During this operation the 'Isly' will keep a careful look-out in the north, in case the enemy should appear from Dunkirk. The 'Épervier' will perform the same duties towards the south.

"On leaving Boulogne, the squadron will stand out to sea, with the apparent intention of proceeding to Havre, but in reality to gain such an offing as will enable it to pass unperceived by the enemy's ships and semaphore stations. The 'Isly,' 'Épervier,' and the torpedo-boats will then close on each other, ready to drive off any light ship of the enemy which may attempt to keep touch with the squadron.

"When this result has been obtained, the 'Épervier' and torpedo-boats will rejoin the squadron, while the 'Isly' will continue her course alone along the French coast, destroying the semaphores and signal stations, and insulting the open towns between Tréport and Havre. She will make an offensive demonstration against the last town, standing to sea before night, and steering such a course as will lead to the belief that the rendezvous with her own squadron is toward the east.

"In the meantime the rest of the squadron will steer so as to avoid all encounter during the night, and will appear before Cherbourg at daybreak on the 23rd.

"It will arrive before that place, following a line drawn between St. Katherine's Point (Isle of Wight) and the centre fort.

"It is in this direction, 10 miles from the breakwater, that the 'Isly' should rejoin; in any case she is to do so before Cherbourg.

"If, on arriving before Cherbourg, the Admiral wishes to have reports of the vessels that may be lying behind the breakwater, he will detach in advance the torpedo-boats, which will approach prudently and attempt to penetrate the roads by the east pass, torpedo any vessels, and leave by the west channel. In this case the torpedo-boats will either receive their orders by word of mouth or by special signal 21."

The Operations.

In accordance with his instructions, Admiral Barrera with the A Squadron left Cherbourg on the 18th July to take up his station in the North Sea in readiness for the opening of hostilities.

The bulk of Squadron B (the defending squadron) lay at Cherbourg, but the "Surcouf" was ordered to Dunkirk, and, with the "Flamme" and five torpedo-boats, was entrusted with the duty of watching for the appearance of the enemy in the Straits.

Squadron A passed the 20th at anchor off Margate; according to the rules laid down, Admiral Barrera could not force the Channel before the morning of the 21st, and he was supposed to be 150 miles to the north at the outbreak of hostilities, a distance which would take him some 17 or 18 hours to cover.

On the evening of the 20th the "Lance" and "Salve" were sent to cruise outside the breakwater at Cherbourg, the "Surcouf," with her flotilla of torpedo-boats, doing the same off the entrance to the Straits.

On the 21st, in the morning, Squadron A weighed and anchored provisionally 8 miles to the N.E. of the North Foreland. During the day the weather, which had been fine hitherto, changed, and it came on wet, with a fresh south-westerly wind. At 8 P.M. the squadron weighed again, and in the formation already indicated, with the "Isly" leading and the "Épervier" sternmost vessel, proceeded to sea; the night was dark, but not foggy. Several vessels and fishing boats were met, but each ship was left to itself as to taking the necessary steps to avoid collision, though care was to be taken not to lose sight of the ship ahead, as all changes in the course or speed were to be made without any signal. The same day the "Lance" and "Salve" continued their scouting from Cherbourg, but as the evening came on, they were reinforced by the "Défi," "Lancier," and two torpedo-boats of the Défense Mobile from Brest, while the "Surcouf," with one torpedo-boat, cruised between the Varne bank and the English coast, leaving the eastern part of the Channel to be watched by the flotilla from Dunkirk.

At midnight (morning of the 22nd) A Squadron passed the Gris-nez—South Foreland line, a sharp look-out being kept for hostile vessels or torpedo-boats; but the passage was effected without any alarm. At 2 A.M. the Varne and Cobalt banks were rounded, without

any sign of an enemy being seen, so that the attacking force had accomplished the first part of their duty, and had only to turn to their left to reach the French coast.

The "Isly" was now sent ahead, and at daybreak took up a position to the N.W. of Boulogne, being joined shortly by the rest of the squadron, which at 3.30 A.M. appeared before Boulogne, and began a bombardment. It was just then that a division of the defending torpedo-boats was seen under Cape Grisnez; these seeing the enemy in the offing, menacing their line of retreat, proceeded full speed to reach a place of refuge, but at daybreak their Commanders, fatigued with their long watch, had gone down to rest, and it thus happened, that, an injudicious course being steered, they tumbled across the "Isly," which they only perceived when too late, with the result that, assisted by the "Turco" and "Épervier," she soon put them out of action. At 4 A.M. the "Flamme" was discovered, as she had been so imprudent as to remain at anchor off Boulogne; she now weighed, but it was too late, the Admiral ordered the "Furieux" to chase, and at 5 A.M., with all her torpedo-boats, she was placed out of action, after an unequal struggle of 20 minutes.

At 6 A.M. a mishap occurred to the engines of the "Grondeur," and she was accordingly sent in to Boulogne to repair damages, as she could take no further part in the operations. The A Squadron remained before Boulogne until 8.30 A.M.; about 7.30 A.M. the "Surcouf" was sighted off Grisnez, and the "Isly" was ordered to chase, but the smaller vessel succeeded in making her escape, and the torpedo-boat with her, evading the "Épervier," slipped away in shore and soon disappeared to the south.

At 9 A.M. the bombardment terminated, and Admiral Barrera, turning to the west, steamed at a speed of 9 knots towards the English coast, leaving the "Épervier" behind to watch the coast, while the "Isly" was still in chase of the "Surcouf;" no attempt was made by any of the torpedo-boats of the defending force to gain touch with the enemy.

Towards 11 A.M. the "Surcouf," which thanks to her superior speed had eluded the "Isly," again came in sight of Squadron A in the north-west, and, taking advantage of the absence of her adversary's cruisers, doubled Beachy Head and stood to the south. She only just got away in time, as her starboard engine became disabled in consequence of the breaking of a piston-ring.

Although all chance of coming up with the cruiser had disappeared, Admiral Barrera, wishing to put her Commander on the wrong scent, altered his course to the east, and gave chase until the "Surcouf" was out of sight; two hours later, the "Épervier" having rejoined, the Admiral altered course to the west again, steering along the English coast.

In the meantime Admiral Lefèvre at Cherbourg learnt at 4 A.M., by despatches sent from Alprech and Grisnez, that the enemy had passed the Straits; he weighed immediately with the defending squadron, and in line ahead stood out through the west pass.

From the semaphore at Barfleur he learnt of the bombardment of Boulogne; he then formed in line abreast, the "Suffren" on the right; this division included, besides the ships already mentioned as forming Squadron B, three torpedo-boats of the Défense Mobile of Brest, which with the torpilleurs-de-haute-mer "Véloce," "Lancier," and "Défi," acted as scouts. In this order Squadron B stood towards Dieppe; towards 2 P.M. it was off Havre, and the torpedo-boats were sent into Brest to reinforce the defence of that place, while the "Lance" was sent to obtain news from the semaphore at La Hève. To the general consternation the reply was made that nothing was known of the enemy, and much precious time was lost; when about 8 P.M. the "Surcouf" arrived, chased once more by the "Isly." The Commander of the cruiser informed the Admiral that he had at midday left the enemy off Beachy Head steering towards Dieppe. More and more surprised at getting no information from the shore, Admiral Lefèvre passed the night of the 22nd—23rd steaming backwards and forwards off Havre.

During all that day the A Squadron in the meantime had been steering to the west, with all the speed permitted; the "Isly," cruising by herself along the French coast, had destroyed all the semaphore stations between Grisnez and Cape Antifer inclusive. When passing Dieppe she made a demonstration against that town, throwing some shells into it, then she allowed herself to be chased by two torpedo-boats stationed there, and when she had drawn them well out to sea, suddenly reducing speed, she kept them well under the fire of her guns for two minutes, and placed them out of action.

At 4 P.M. the A Squadron altered course to the S.W., and, in a lovely night, sighted about 11 P.M. the electric light of Barfleur, and the various search lights of the forts of Cherbourg, searching the horizon in all directions.

At 2 A.M. of Sunday the 23rd two torpedo-boats of the Défense Mobile of Cherbourg re-entered the harbour, without having attempted any attack; they, however, reported suspicious lights in the N.W.

At 3 A.M. the A Squadron, in which care had been taken to keep all lights masked during the night, perceived the "Buffle" detached as an advance look-out 5 miles from the breakwater; this ship was seen to exchange many signals with the shore. Half-an-hour later Admiral Barrera altered course to the E., in order to pass some distance along the sea-front of Cherbourg, and fire some shells into the place. At this moment the "Isly" was sighted returning, and the "Turco" was sent to reconnoitre; but, in consequence of the indistinctness of the dawn, the torpedo-boat was not immediately recognised by the "Furieux" and "Épervier," who opened fire upon her for some seconds. In spite of the private signals being shown, a similar occurrence took place between the "Buffle" and a torpedo-boat of the Défense Mobile. Not being strong enough to attack Cherbourg, Admiral Barrera altered course again to the N. At 4 A.M. he was informed by the "Isly" that the "Surcouf" and some torpedo-boats had rejoined Admiral Lefèvre off Havre. When some

little distance again from the land, the Admiral altered course again to the N.E., and at 6 A.M. the Isle of Wight was sighted four points on the port-bow.

Realizing at last that no information was to be obtained from the semaphore station at La Hève, Admiral Lefévre on the morning of the 23rd detached the "Lance" to communicate with the signal station at Barfleur, while he stood with the squadron to the W. in extended order, to scout, and having the "Salve" and "Surcouf" farthest out at sea.

About 9 A.M. the "Lance" brought the news that at daybreak the enemy's squadron had made a short demonstration before Cherbourg, after which it had disappeared towards the north. A few minutes later the "Surcouf" signalled that she could see several columns of smoke moving to the north-east.

Admiral Lefèvre altered course to the north-east, and prepared to chase, but the "Suffren" and the "Fulminant" had soon attained their maximum speed, and it was found they were losing on the "Surcouf;" as for the "Éclaireur," she had quickly dropped astern, and, moreover, signalled something wrong with her machinery, so that she could not proceed more than 6·5 knots. The Admiral therefore determined to support the "Surcouf" by the "Requin," the torpedo-avisos, and the "Lancier." Thus constituted, the advance-guard possessed a real superiority in speed, which at first permitted it to gain sufficiently rapidly on the enemy.

At 8.30 A.M. the "Épervier" reported the "Surcouf" in the south-east, and immediately the "Isly" received orders to chase the hostile cruiser; half-an-hour later she perceived in her turn, and signalled to Admiral Barrera, the presence of the whole of the defending squadron in the same quarter. Consequently, at 10 A.M., the "Victorieuse" made sail, and did all she could to keep ahead; at the same time the English coast rose on the port side, and assured a refuge if the necessity arose.

At midday the "Turco" conveyed the Admiral's orders to the "Isly," to remain astern and observe the enemy. This fine cruiser made a diversion on the flank of the hostile scouts, cutting off one of the avisos, and, passing between the "Surcouf" and her supports, forced her back on the "Requin," if she did not even put her out of action. At 2 P.M. Squadron A rounded Beachy Head, passing about 3 miles off it, and at that time was 6 miles ahead of the chasing squadron.

About the same time the "Surcouf's" port engines also broke down, so that she could barely creep along at 7 knots, and Admiral Lefèvre, finding it was no longer in his power to overtake the enemy, sent the "Lance" with a flag of truce to the "Isly," and directed her Commander to signal the conclusion of hostilities to Admiral Barrera, who accordingly made for Dunkirk, anchoring there at 11 P.M.

Admiral Lefèvre returned with his division, with the satisfaction of having only once seen the enemy during the three days the manœuvres lasted. On the morning of the 24th he regained Cherbourg, and, as the result of communications with the Minister of Marine,

the second part of the manœuvres was given up, on the plea of a want of cruisers, the "Surcouf" having broken down, and the "Éclaireur" being ordered to Brest, to fit out for service in China.

The manœuvres being thus brought to a premature conclusion, some torpedo exercises were carried out by three of the battle-ships, two torpedo-avisos, and two torpedo-boats; the torpedos were fitted with collapsible heads.

The "Requin" and "Furieux" were the ships aimed at. The torpedo from the "Véloce" turned aside and passed astern of the target; that from the "Défi" sank. The torpedo from the "Lance" shaved close to the ram of the "Furieux," but without touching; that from the "Salve," when half-way, plunged vertically downwards, then emerged with its tail in the air, and refused to go further. The torpedo from the "Suffren" passed astern of, and that of the "Furieux" ahead of, the mark (the "Requin"); the one from the "Requin" struck the "Furieux" a little ahead of her funnel, but during the last part of its run was so close to the surface, that a great part of the effect of the explosion would have been lost. Out of seven discharges, six were more or less failures, and one only fairly good.

On the 3rd August, in the evening, the "Tonnerre," escorted by the "Lance" doing duty as a catcher, weighed at 4 P.M.; after an hour's interval, she was followed by a group of three torpedo-boats, the "Véloce," "Défi," and "Turco," which were to keep touch with the ironclad and attempt to torpedo her during the night. The attack failed, however, completely; the "Défi" broke down, the "Turco" alone approached the battle-ship, but was discovered and driven off by the "Lance." At Brest, the tug "Haleur," representing for the time being a battle-ship, and accompanied by four torpedo-boats, went out under the command of Capitaine-de-frégate Borgnis-Desbordes, and having chosen an anchorage for the night, was discovered and attacked by six torpedo-boats of the Défense Mobile. On the following night the "Haleur" and her small flotilla in their turn attacked the roadstead, which was defended by eight boats. This attack was considered successful, although the "Haleur" was counted as having been sunk. The operations are said to have taught some useful lessons as to the management of the search lights. This brought the exercises of the squadrons to a conclusion, and after inspection the mobilized vessels returned to their posts.

In a brief review of the operations by M. Weyl, in the "Journal des Débats," that able writer lays stress upon the absolute necessity of creating Boulogne a military port, sufficiently large to shelter three or four battle-ships, as he considers that only from these can the Straits be properly watched in time of war. In deference to public opinion, he points out that Dunkirk has been made the first échelon of the Défense Mobile; Boulogne, in his opinion, should be the second échelon, and the *point d'appui* for the fighting fleet; Cherbourg would be the third échelon, the centre of the Reserves; its importance would not be diminished, as it would still remain the great arsenal for the Channel.

M. P. Leguenic, writing in the "Marine de France," also considers that the result of the operations has been to prove that Cherbourg is too far from the Straits to serve as an efficient base of operation for the defence against an enemy coming from the north; he is of opinion, however, that further experiments must be carried out under varying conditions of weather, both by night and day, before it will be possible to decide finally whether the new base should be fixed at Calais, Dunkirk, or Boulogne. There further seems to be a general consensus of opinion that the semaphore and signal stations must be completely reorganized, and, above all, that immediate steps should be taken to connect all the stations with each other by telegraph or telephonic wires, so as to avoid a repetition of the scandal of signal stations being in complete ignorance of events which may be happening only a few miles away from them.

Vice-Admiral Vignes, as Umpire-in-Chief, has issued his report on the manœuvres in the Mediterranean. He calls attention to the fact that it was chance, and chance alone, which enabled Admiral Le Bourgeois to meet and defeat Admiral Prouhet. Had the information sent by the "Davout" reached Admiral Le Bourgeois on the night of the 20th—21st, Admiral Prouhet would most certainly have escaped, and ravaged with impunity the coasts of Corsica. He is of opinion that Admiral Prouhet's plans were judicious and well-conceived, and that his cruisers performed their duty well, and that he might have been completely successful, but for the persistent way in which the "Davout" managed to keep touch with him. On the other hand, he considers that several of the smaller scouts of the defending force failed to carry out the instructions given them and to take up the places assigned to them in rear of the "Dévastation," neither should it have been possible for Admiral Prouhet's cruisers to range up and down as they did; they ought to have been destroyed on the morning of the 20th. The manœuvres, nevertheless, have not been totally devoid of good, as even from the faults committed there are useful lessons to be drawn for future use.

NAVAL AND MILITARY NOTES.

NAVAL.

Home.—The award of Vice-Admiral Sir W. Hunt Grubbe, Rear-Admiral Lord Charles Scott, and Rear-Admiral Rawson, the Umpires in the late Naval Manœuvres, has been made public. They hold that the Red Fleet captured or destroyed four 2nd class cruisers (including two which were inadvertently blown up by their friends), 24 1st class torpedo-boats, and three 2nd class torpedo-boats belonging to the Blue; and that the Blue Fleet, on the other hand, captured or destroyed one 2nd class battle-ship, six 2nd class cruisers, and three 1st class gun-vessels belonging to the Red. These losses may be appraised approximately as follows (according to the "Naval and Military Record"):—A 2nd class battle-ship is worth 750,000*l.*, and carries 400 officers and men; a 2nd class cruiser is worth 200,000*l.*, and carries 275 officers and men; a 1st class gun-vessel is worth 60,000*l.*, and carries 85 officers and men; a 1st class torpedo-boat is worth 20,000*l.*, and carries 20 officers and men; and a 2nd class torpedo-boat is worth 5,000*l.*, and carries 8 officers and men. Supposing all the vessels which have been officially adjudged out of action to have been totally destroyed, the bill of losses in human life and matériel during the week's hostilities would have stood thus:—

Losses by Blue.			Losses by Red.		
Ships.	£	Men.	Ships.	£	Men.
4 2nd class cruisers .	800,000	1,100	1 2nd class battle-ship	750,000	400
24 1st class torpedo-boats	480,000	480	6 2nd class cruisers	1,200,000	1,650
3 2nd class torpedo-boats	15,000	24	3 1st class gun-vessels	180,000	255
	£1,295,000	1,604		£2,130,000	2,306

Blue, it will be recollected, was slightly the weaker side, and was supposed to represent an enemy—such as France might be—fairly well supplied with torpedo-boats. Red was slightly the stronger side, and was supposed to represent a country, *such as our own is, numerically strong in cruisers, "catchers," and fast sea-going* ships. It is, therefore, not satisfactory to note that Blue has been adjudged to have done considerably more damage to Red than Red was able to do to Blue, both in material and men; and it is the more unsatisfactory when we remember that the mischief was practically wrought by the despised torpedo-boats, in which France is so strong and we, comparatively speaking, are so weak.

The 1st class battle-ship "Anson" has been paid off, and her officers and crew transferred to the "Empress of India," which ship becomes the flag-ship of the Second-in-Command in the Channel. The "Anson" has been commissioned by

Captain Dowding, and goes to the Mediterranean, taking the place of the 2nd class battle-ship "Colossus," which returns to England. The officers and men of the "Rodney" are also to turn over to the "Resolution" as soon as she is ready, when she will take her place in the Channel Squadron, and the "Rodney" will then be recommissioned for service in the Mediterranean, relieving the "Edinburgh," which will return to England.

The new 2nd class cruiser "Bonaventura" has successfully carried out her steam trials. During the eight hours' natural draught trial a speed of 19·2 was obtained, with an indicated horse power of 7,340. During the four hours' forced draught trial an indicated horse power of 9,279 was developed, giving a mean speed of 20 knots; mean steam in boilers, 145 lbs.; mean steam in engine-room, 136 lbs.; air pressure in stokeholds, 0·87 in.; vacuum—starboard, 26·4; port, 26·1; revolutions—starboard, 144·9; port, 141·4; mean pressures in cylinders, high-pressure—starboard, 53·1; port, 54·1; intermediate—starboard, 29·5; port, 29·0; low-pressure—starboard, 14·5; port, 14·5; I.H.P.—starboard, 4,685; port, 4,594; total, 9,279; speed by log, 20 knots. The mean speed of three runs along the land was 20·3 knots; in one a speed of 22 knots was reached. The helm was put hard-a-port from hard-a-starboard in 22 secs.

The steam trials of the 1st class battle-ship "Resolution" have also been completed. During the eight hours' natural draught run, with a steam pressure in the boilers of 148 lbs., a vacuum of 28 in., and 97 revolutions per minute, the engines developed 9,237 I.H.P., being 237 H.P. over the contract. A speed of 16·7 was maintained; but, as the ship was very light, it cannot be looked upon as a fair criterion of her speed when at normal draught. During the four hours' run under forced draught, the engines developed 11,379 I.H.P.; the air pressure employed was 0·6 in., and the average speed 17·9 knots; the ship drawing 3 ft. less water than her normal load line.

The "Devastation," the earliest of our sea-going masteless turret-ships, after undergoing a thorough renovation and reconstruction in hull, machinery, and armament at Portsmouth, has completed her steam and gunnery trials, and is now ready for commissioning. Laid down in November, 1869, launched at Portsmouth (or rather floated out of the dry dock in which she was built) on July 12th, 1871, and first commissioned by the late Admiral Hewett on August 17th, 1872, the "Devastation," in spite of her age, now figures once more as a most important fighting ship. The changes between her original and present armament will be readily perceived from the following:—

Old.	*New.*
4 12-in. 35-ton M.L.R. guns.	4 10-in. 29-ton B.L. guns.
1 9-pr. 8-cwt. gun.	2 7-pr. 200-lb. guns.
1 7-pr. 200-lb. gun.	6 6-pr. Q.F. guns.
6 6-pr. Q.F. guns.	8 3-pr. Q.F. guns.
2 0·45-in. 5-barrel Gardners.	5 0·45-in. 5-barrel Gardners.
12 14-in. Whiteheads with 2 broadside above-water tubes.	12 14-in. torpedoes with 2 submerged tubes.

The new guns have a combined muzzle energy of 59,184 ft.-tons, against the combined muzzle energy of only 39,086 ft.-tons of the old ones. The new guns have a total length of 342·4 in., a length of bore (including powder chamber) of 322 in., and a diameter of 43 in. at the breech tapering to 16 in. at the muzzle; they throw a projectile weighing 500 lbs. with a full charge of 252 lbs. of brown prismatic powder; the muzzle velocity is 2,040 ft. per second, and the muzzle energy 14,430 ft.-tons. The turret guns are loaded by hand, and this can be done in any position; the turrets, however, are rotated by steam, and during her refit a duplicate turning engine has been attached to each turret as a precaution. The new machinery has been supplied by Messrs. Maudslay, Sons, and Field. Formerly the ship was propelled by engines of the direct-acting trunk type, made by Messrs.

John Penn and Sons. The new propelling machinery consists of two sets of inverted triple-expansion engines of the collective power of 5,500 I.H.P. with natural draught, and 7,000 I.H.P. with forced draught. Each set has a high-pressure cylinder 34½ in. in diameter, an intermediate 51 in. in diameter, and a low-pressure 76 in. in diameter, with a stroke of 3 ft. 6 in. The condensers have a total cooling surface of 9,000 sq. ft., and the working pressure of the boilers is 140 lbs. to the square inch. In the Estimates the probable cost of refit is given at 156,261*l.*, which includes 67,555*l.* for hull, &c., 68,187*l.* for machinery, and 11,324*l.* for gun mountings and torpedo-gear. At her eight hours' natural draught trial on September 14th, her trim was 25 ft. forward, and 26 ft. 8½ in. aft; the average boiler pressure was 140 lbs., and the mean vacuum was as high as 28·2 in. starboard and 28½ in. port. With 94·4 and 92·2 revolutions the engines developed 3,139 and 2,861 I.H.P., giving a collective mean power of 6,000, or 500 I.H P. above the contract. The mean air pressure in the stokeholds was ½ in., and the coal consumption 1·8 lbs. per unit of H.P. per hour. The speed obtained was 13·2 knots; the trial was satisfactory, but the speed was slightly under the estimate. On the 14th September, the ship made her four hours' forced draught trial, with satisfactory results. Steam in boilers, 141·6 lbs.; revolutions, 100·2 and 100·7; vacuum, 28·4 and 28·5 in.; I.H.P. starboard, 3,727; port, 3,847; collective I.H.P., 7,214 (contract 7,000). The average air pressure was 1·03 in., the maximum allowed being 2 in., and the coal consumption 2·1 lbs. per I.H.P. per hour. The speed realized was 14·5 knots. The "Devastation" will be commissioned immediately to take the place of the "Swiftsure" as port guard-ship at Plymouth.

The following Return, issued by the Admiralty, giving the number of "sea-going war-ships in commission, in reserve, and building, and the naval expenditure of various countries for the year 1893," may be of interest for reference.

It gives the English war-ships in commission as 24 battle-ships, 3 coast-defence ships, 60 cruisers, and 74 other ships not torpedo-boats, altogether 161; we have in reserve 10 battle-ships, 14 coast-defence ships, 46 cruisers, and 44 other ships not torpedo-boats; and in addition we have building and completing for sea 9 battle-ships, 19 cruisers, and 22 other ships; total 325.

France is represented as having in commission 19 battle-ships, 5 coast-defence ships, 23 cruisers, and 50 other ships not torpedo-boats; while she has in reserve 5 battle-ships, 3 coast-defence ships, 20 cruisers (armoured and unarmoured), and 62 other ships; and building and completing for sea, 8 battle-ships, 2 coast-defence ships, 19 cruisers (armoured and unarmoured), and 5 other ships; total 221.

Germany has in commission 11 battle-ships, 14 cruisers, and 19 other ships; in reserve, 3 battle-ships, 6 coast-defence ships, 17 cruisers, and 5 other ships; besides 7 battle-ships, 3 cruisers, and one other ship building and completing for sea; total 86.

Russia has in commission 5 battle-ships, 9 cruisers (armoured and unarmoured), and 34 other ships not torpedo-boats; in reserve, 2 battle-ships, 9 coast-defence ships, 6 cruisers (armoured and unarmoured), and 37 other ships not torpedo-boats; building and completing for sea, 8 battle-ships, 4 coast-defence ships, 2 cruisers (1 armoured), and 4 other ships not torpedo-boats; total 120.

Italy has in commission 4 battle-ships, 8 cruisers, and 16 other ships not torpedo-boats; in reserve, 9 battle-ships, 5 coast-defence ships, 5 cruisers, and 26 other ships not torpedo-boats; building and completing for sea, 4 battle-ships, 13 cruisers (armoured and unarmoured), and 3 other ships not torpedo-boats; total 93.

The United States, no battle-ships in commission or reserve, 5 building; coast-defence ships, 2 in commission and 16 in reserve, and 2 building; cruisers, 13 in commission, 3 in reserve, and 11 (armoured and unarmoured) building or completing for sea.

The aggregate naval expenditure of England is given as 18,480,916*l.*; that of France, 10,694,860*l.*; of Germany, 4,795,570*l.*; of Russia, 5,040,139*l.*; and of Italy, 4,215,636*l.*; so that the present naval expenditure of England is nearly equal to that of France, Germany, and Russia combined.

With reference to the official Return above mentioned, a naval correspondent writes as follows: "I have not the complete Return before me, and do not know

how the classification of ships, especially as between battle- and coast-defence ships has been arrived at; but, taking the figures as they stand, it is to me astonishing that, with this Return on the table, the Naval Estimates should have been discussed for two days without any attention having been called to the serious state of things it reveals. The country has been led to believe, first, that both of the great parties in the State were agreed as to the necessity of maintaining, as the irreducible minimum strength of our Navy, that it should at least be equal to the combined fleets of any other two Powers; and, secondly, that the Naval Defence Programme of 1888, when complete, would practically put us into that position. Apologists for the present state of things and persons casually glancing at the Return will probably point out that, as our effective war-ships number 325, and as the effective war-ships of France and Russia combined, for instance, only number 341, the required balance, if it does not actually exist, still has been very nearly attained.

"What are the true facts of the case if this Return is analyzed? It is not denied that the command of the Channel and Mediterranean can only be assured by means of a preponderating force of battle-ships, for no numerical superiority in cruisers can compensate for a deficiency in the numbers of the former. I will, therefore, take the figures as regards battle-ships for England, France, and Russia from this official Return and see how we stand:—

	England.	France.	Russia.
Battle-ships in commission, reserve, building, &c.	43	32	15
		47	
Coast-defence ships, reserve, building, &c.	17	10	13
		23	
Total battle- and coast-defence ships	60	70	

"It will thus be seen that, so far from being equal to France and Russia combined in the most vital matter of battle-ships, we are numerically considerably over-matched, and that it will take a new battle-ship programme as large as the last to put us even on an equality; but during the last two years only one new battle-ship, the 'Renown,' has been laid down, and, although the plans for the 'Magnificent' and 'Majestic' have been approved, these ships have not yet been commenced, and, as a set-off to these, three new battle-ships are to be laid down in France next year. As with the battle-ships, so with regard to men; but here we are even in a worse case, for when France and Russia call up their Reserves they can dispose of at least 100,000 more men than ourselves. The question, therefore, may well be asked, how it is that, with our enormous expenditure, we are yet so dangerously short in ships, officers, and, above all, men; how it is, in fact, that with an expenditure nearly approaching that of three other great Powers combined, and which ought, therefore, to have at least given us a well-assured superiority over two of the given Powers, we are not even equal to those two in battle-ships, and are out-numbered nearly two to one in the matter of men."

France.—The following changes have been made in the commands of the home squadrons, and will take effect from the 1st October. Vice-Admiral Vignes hauls down his flag as Commander-in-Chief of the Active Squadron of the Mediterranean, and assumes the appointment of Maritime Prefect of the 5th Arrondissement Maritime (Toulon); he is succeeded in command of the squadron by Vice-Admiral de Boissoudy, whose place in command of the Reserve Mediterranean Squadron is taken by Vice-Admiral de la Jaille; Vice-Admiral Lefèvre is succeeded in the command of the Channel Squadron by Vice-Admiral Brown de Colstoun; Vice-Admiral

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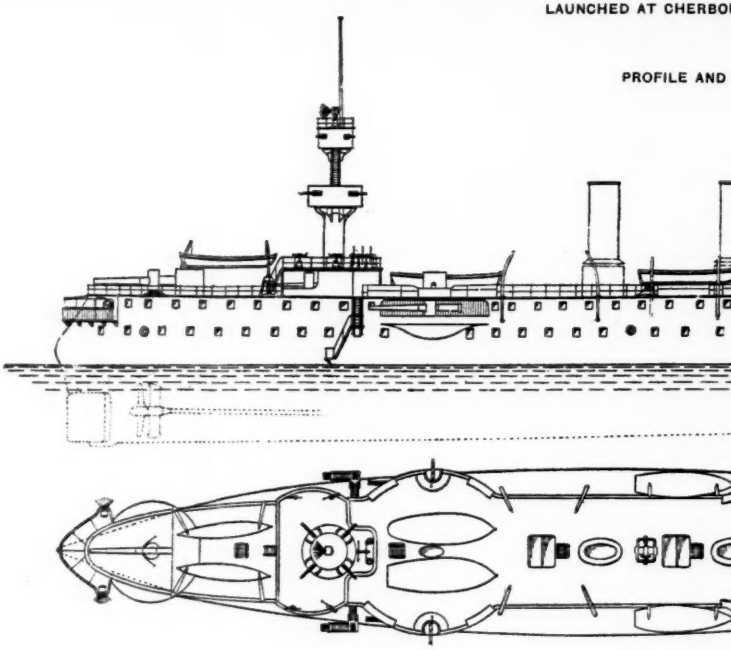

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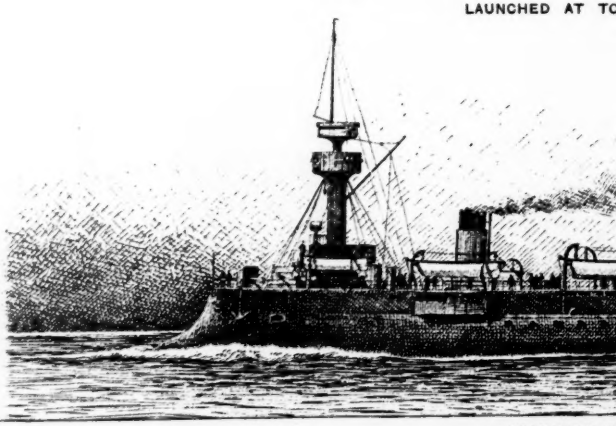

HARRISON & SONS, LIT

ASSELOUP-LAUBAT," 3,700 TONS AND 9,000 H.P.

HERBOURG, 18TH APRIL, 1893

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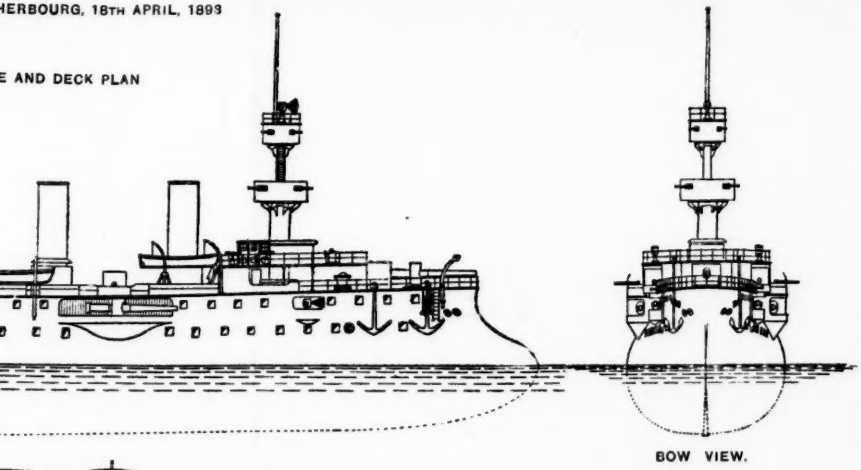

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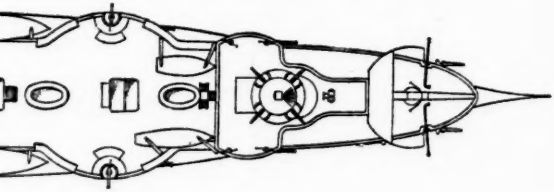

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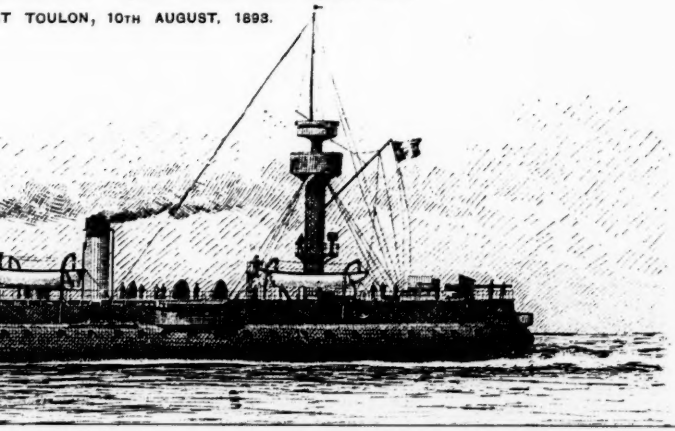

ONS. LITH. ST. MARTINS LANE, W.C.

Besnard becomes Maritime Prefect of the 2nd Arrondissement (Brest); and Vice-Admiral Dorlodot des Essarts, Inspector-General of the Navy. ("Le Petit Var.")

The following are the principal dimensions of the new 2nd class cruiser "Suchet," which was launched at Toulon, on the 10th August. The ship is a modified "Davout," being 19 ft. longer, and has been fitted with an under-water torpedo-tube, in addition to the six above-water tubes. Her length is 317 ft. 6 in. between perpendiculars; beam, 42 ft.; displacement, 3,430 tons, with a mean draught of 17 ft.; her engines will develop 5,000 I.H.P. under natural draught, and 9,000 under forced, with an estimated speed of 20 knots. Her armament will consist of six 16-cm. (6·2-in.) Q.F., four 10-cm. (4-in.) Q.F., eight 47-mm. (3-pr.) Q.F., and twelve 37-mm. (1·45-in.) Q.F. guns. Her protective deck is 4 in. thick, tapering to 2 in., and she has two military masts, each with two fighting tops, in the lower of each of which four of the 3-prs., and, in the upper, four of the 37-mm., Q.F. guns will be mounted. A similar ship, the "Bugeaud," but some 300 tons more displacement, was launched at Cherbourg on the 29th August. By the kindness of the editor of the "Yacht," we are enabled to give a sketch of the "Suchet," also the profile and deck plan of the "Chasseloup-Laubat," one of a similar type of ship, from which it will be seen that in the matter of armament, weight of guns, and disposition for end-on fire, these French 2nd class cruisers are far superior to our own vessels of the "Melampus" type, although only about the same tonnage. For end-on fire either ahead or astern, our ships can only use the solitary 6-in. gun on the poop or forecastle, as the case may be; the French ships, on the other hand, can bring to bear, either ahead or astern, three 6-in. and two 4-in. Q.F. guns. On the beam, our ships can utilize two 6-in. and three 4·7-in. Q.F. guns, against the four 6-in. and two 4-in. Q.F. guns of the French vessels; in addition to which, the fire from the eight small Q.F. guns mounted in their military tops, with which none of our cruisers are fitted, would leave the crews of our ships subjected to a galling fire to which they will be able to make no effective reply. The French ships are also much higher out of the water than ours, and the accommodation for men proportionately improved.

The "D'Iberville," a new torpedo-aviso of an improved type, which was launched at Saint Nazaire on the 26th August, is a vessel 262 ft. 6 in. long, a beam of 26 ft. 2 in., and, with a mean draught of 11 ft. 1 in., has a displacement of 925 tons. The engines are to develop 5,000 I.H.P., and to give a speed of 21·5 knots. The armament consists of one 10-cm. (4-in.) Q.F. gun, forward, three 65-mm. (9-pr.) Q.F. guns, four 37-mm. (1·45-in.) Q.F. guns, and six torpedo-tubes. Her estimated cost is 117,960*l*. The "D'Iberville" is thus considerably larger than the first of this class, the "Bombe," and her seven sisters, built in 1885, which are vessels of only 395 tons, with a speed of 18 knots, and an armament of four 47-mm. (3-pr.) Q.F. guns, and three machine-guns. Although of less tonnage, she is 39 ft. longer than the torpedo-cruisers of the "Condor" type, and has much more powerful engines, and an advantage in speed of 4 knots; it is considered doubtful, however, if she will prove so good a sea-boat. ("Le Petit Var.")

The new torpilleurs-de-haute-mer "Mousquetaire" and "Corsaire" have been ordered to proceed from Cherbourg to Toulon, where they will be attached to the active squadron of the fleet; both of these vessels made 26 knots on their trial trips. ("Le Petit Var.")

The French Naval Estimates for the year 1894, which have been approved, show an expenditure of 267 million francs, an increase of 63 million francs over the Estimates of 1890, and contemplate the laying down of no fewer than 32 new vessels of various types, viz.: Three 1st class battle-ships, one 1st class cruiser of the same type as the "D'Entrecasteaux," which it was originally intended to have commenced this year, five 2nd class cruisers, one 3rd class cruiser, one torpilleur-de-haute-mer, five 1st class torpedo-boats, four 2nd class torpedo-boats, nine torpedo-launches, one 2nd class despatch vessel, and three gunboats.

The designs for the new battle-ships are not yet quite complete, but many of the

details are forthcoming. They are designated as A3, A4, and A5, and are to be of 12,000 tons displacement, and to be protected by a belt of steel armour with a maximum thickness of 17½ in., and there are to be two armoured decks. It is understood that the armament will consist of four 30-cm. (11·8-in.) guns, and an auxiliary armament of ten 16-cm. (6·2-in.) Q.F., six 10-cm. (4-in.) Q.F., sixteen 47-mm. (3-pr.) Q.F., ten 37-mm. (1·45-in.) Q.F., and eight machine-guns. The torpedo-tubes will be submerged. The system of turrets, each carrying two guns, is to be adopted: they will be revolving and covered. The 6-in. and 4-in. guns will be protected by shields 3 in. thick. The machinery for revolving the turrets, loading, and supplying ammunition will be worked by electricity, the apparatus to be adopted being similar to that used in the "Capitan Prat," which has proved very effective. It is most likely that the machinery, boilers, &c., will be placed in three separate compartments, and that the new vessels, like the "Dupuy-de-Lôme," the "Massena," and the "Bouvet," will be provided with three screws. With forced draught a speed of 18 knots is to be attained. France will thus possess in 1894 nine new 1st class battle-ships in various stages of completion: the "Brennus" and "Bouvet," which are being constructed at L'Orient; the "Charles Martel," at Brest; the "Jauréguiberry," at La Seyne; the "Lazare-Carnot," at Toulon; the "Massena," at Saint Nazaire; and the three new vessels mentioned, besides the three coast-defence battle-ships, the "Tréhouart," "Bouvines," and "Valmy." One of the new vessels is to be built at a private yard, the other two being laid down in Government yards.

The 2nd class cruisers, one of which will be built in a Government yard and four by contract, are of two types. The first type, which is to include the vessels provisionally known as E4, E5, and E6, will be of 3,990 tons displacement, 9,000 I.H.P., and 19 knots speed, carrying four 6·2-in., ten 4-in., fourteen 47-mm. (3-pr., 1·85-in.), and four 37-mm. (1·45-in.) guns, all quick-firing. The second type, which is to include the vessels provisionally known as G3 and G4, will be of 3,800 tons displacement, 9,100 I.H.P., and 19·2 knots speed, carrying six 6·2-in., four 4-in., eight 47-mm. (3-pr., 1·85-in.), and twelve 37-mm. (1·45-in.) Q.F. guns. These five vessels are improved "Chasseloup-Laubats."

The 3rd class cruiser, which is to be built in a Government yard, will be a modified "Galilée," of 2,300 tons displacement, 6,600 I.H.P., and 20 knots speed, carrying four 5·5-in., two 4-in., eight 3-pr., four 37-mm. Q.F. guns, and four machine-guns.

The activity displayed by the French in increasing their torpedo-boat flotilla is shown by the fact that in 1886 they possessed 63 boats only; but if we include the boats planned and under construction, it appears that next year they will have not less than 229. The torpilleur-de-haute-mer, N12, which will be built by M. Normand, of Havre, will be the same size as the "Forban," now under construction by that firm, and will be of 125 tons displacement, 3,260 I.H.P., and 30 knots speed. She will be 144 ft. long, and will carry two 3-pr. Q.F. guns in addition to her torpedo-armament. The five 1st class torpedo-boats, P20 to P24, will be of 80 tons displacement, 1,350 I.H.P., and 23·5 knots speed; and the four 2nd class boats, Q1 to Q4, will be of 53 tons displacement, 700 I.H.P., and 20·5 knots speed. There are also included in the 1894 programme for continuation, the torpilleurs-de-haute-mer "Filibustier," "Ariel," and "Forban," building by M. Normand; the "Tourmente" and "Argonaute," by the Société de la Loire; the "Averne" and "Dauphin," by the Société de la Méditerranée; and the "Lansquenet," at Oriolle, as well as the 1st class boats, Nos. 180 to 191, by Normand; Nos. 192 to 194, by the Société de la Gironde; Nos. 195 to 198, by the Établissements Cail; and Nos. 199 and 200, the contract for which has not been given out yet. The torpedo-launches, nine in number, which are intended to be carried on the deck of the new torpedo-depôt ship "Foudre," will be 62 ft. 4 in. long, displacing 14 tons, having engines of 210 I.H.P., and an estimated speed of 16·5 knots. It is expected that they will be built at Creusot, where the plans have been prepared.

The 2nd class despatch vessel U1 will be of 620 tons; and the plans for the three river gunboats, the "Onyx" and X2 and X3, have not been made public.

The most noteworthy feature in the new French building programme is the enormous multiplication of guns in the larger ships. Each of the battle-ships will mount as many as 54 guns, of which no fewer than 50 will be quick-firing guns of

different calibres. This number is far in excess of that carried by any English ship, the difference being most marked in the cruisers, and, as we have already pointed out, all our new 2nd class cruisers, for instance, of the same tonnage as the French are put at an enormous disadvantage in the matter of armament. ("Times" and "Le Yacht.")

Italy.—Some interesting articles which have been appearing in the "Rivista Marittima," by Signor V. E. Cuniberti, an officer in the Italian navy, on the question of liquid fuel, to experimenting with which he has devoted a great deal of time, have now been issued in pamphlet form by the publishers of that journal.

The author deals with:

1st. The principal kinds of liquid fuel which can be used for the production of motive power.
2nd. Petroleum and the three methods of using it in the engines.
3rd. Advantage and defects of its use in the cylinder.
4th. Its use in the boiler in place of water.
5th. Its use in the furnace in lieu of coals.
6th. Its application to war-ships and merchant-ships.
7th. Pulverization of petroleum residues (mechanical, by steam, and by air).
8th. Its use in torpedo-boat 104, "Schichau" type, and the relative diagrams.

From a hasty perusal of the author's review of the history of petroleum as fuel, it appears that the method of using it, in conjunction with coal to obtain an increased rate of combustion, is the only one which is likely to have any appreciable influence on modern engineering practice in most European navies. In Russia, where every advantage exists for the employment of petroleum residue, after extensive trials and experiments, the consumption has been reduced from 9¼ lbs. per I.H.P., in 1870 on the Caspian, to about 4½ lbs. per I.H.P.; but even the latter quantity is excessive for European navies, which would have to pay about ten times the price which Russia pays on the Caspian for this material. With regard to its uses in conjunction with coal, the author states that the problem of the pulverization of the residue, with the expenditure of little or no steam for the purpose, has now been solved by the new apparatus, and the consumption so reduced in weight, space, and cost, that in our seas also it may compete with coals in these respects. The pamphlet from which the above has been taken is of an exhaustive nature, the author having investigated the causes of the failure or partial success of a vast number of experiments carried out in his own and other countries, more particularly in Russia and America, and his efforts certainly deserve to be rewarded by success. His system, broadly stated, is to use petroleum alone, more or less refined, for the boilers of torpedo-boats; the petroleum jet being broken up into fine spray and dispersed on ignition by another jet of steam from the boiler; the vapour arising from the steam jet, with the addition of a certain amount of water produced by the combustion of the petroleum, is afterwards condensed and returned to the boiler, so that the actual expenditure of fresh water is almost nil. This condition is absolutely necessary for the success of the system in torpedo-boats, which can neither carry a large store of fresh water, heavy condensing apparatus, nor air compressors, if an air jet is used instead of steam. On larger ships and vessels, crude petroleum, or petroleum refuse and small coal, can be employed, the arrangements being modified to suit. The author also points out how, by the adoption of liquid fuel, many modifications and improvements can be made in the structural arrangements of ships, which will tend to make them less vulnerable, by largely increasing the present system of subdivision. Signor Cuniberti, who is at present attached to the 1st class battle-ship "Lepanto," flag-ship of H.R.H. the Duke of Genoa, has been sent to Wilhelmshaven, at the special request of the German Emperor, to superintend the trial of his system on board some German torpedo-boats, and it is probable that it also will be tried in the Austrian navy.

The protected ram-cruiser "Elba" has been launched at Castellamare. She is a little smaller than the "Giovanni Bausan," but larger than the "Lombardia," "Liguria," "Etruria," and "Umbria." Her length is 273 ft., her beam 41 ft.

8 in., displacement 2,730 tons, and her engines 6,500 I.H.P., with an estimated speed of 19 knots. Her armament will consist of four 6-in. Q.F., six 4·7-in. Q.F., and eight 3-pr. Q.F. guns, with four torpedo-tubes.

Russia.—*The Russian Naval Manœuvres in the Baltic* began on August 25th, most of the vessels having previously assembled at Libau, under Vice-Admiral Gerken, to be present at the grand inaugural ceremonies of the laying of the first stone of the new military port, which was performed by the Tsar in presence of the Imperial family on the 24th August. The Russian press have attached great importance to the ceremony; the "Moscow Gazette" states that "the transfer of Russia's military port from Cronstadt to Libau was decided upon not only because the roadsteads at the latter place are not frozen in winter, but also on the ground that from a geographical point of view Libau is so situated as to afford every facility for effectually protecting the Russian Baltic littoral against attacks by foreign fleets." Other Russian critics find fault with Libau as a naval station, on account of the facility with which England, or some other naval Power, could shut up Russia's fleet in the Baltic, and there are advocates for a naval seaport on the northern coast not far from Norway, to which plan we referred in the July number of the Journal. Libau is an extremely flourishing town with a large population, mostly Germans, and the new port is to be used for commercial purposes, as well as military. In a general order to the Russian Baltic Fleet, the Tsar dwells upon the importance of Libau, and observes that the construction of a harbour which would not freeze in winter had already been planned by his father.

The offensive manœuvre squadron was under the command of Vice-Admiral Gerken, and consisted of:—

Battle-ships—"Imperator Alexander II" (flag).
" coast-defence—"Admiral Spiridov."
" " "Admiral Greigh."
Armoured cruiser—"Gerzog Edinburskij."
Clippers—"Plastun," "Strjelok."
Torpedo-cruiser—"Vojevoda," and three torpedo-boats.

The defending force was under Rear-Admiral Giers, and was composed of:—

Coast-defence battle-ship—"Carodiejka."
Armoured gunboats—"Grozjasčiji."
" " "Gremjasčiji."
Torpedo-cruiser—"Posadnik."
The harbour steamer "Rabotnik," and eight torpedo-boats.

The main purpose of Admiral Gerken, coming from the Baltic, was to reach Biorke Sound, lying between Biorke and an island opposite to it, and of Admiral Giers to prevent this by watching his movements, and attacking him in the channels between the islands with torpedo-boats. Admiral Gerken's first object was to occupy the Moon Sound as a base for his proceedings. The programme of the manœuvres is much the same as that of the last two years, and the idea, to test the defensibility of the Gulf of Finland and of the approaches eastward.

The coast-defence battle-ship "Admiral Uschakov," a sister ship to the "Admiral Senjavin," which was launched last April, is nearly ready for launching. The two large armoured cruisers of the "Rurik" type under construction will have a displacement of about 12,000 tons and engines of 15,000 I.H.P., giving them a speed of not less than 20 knots. They will carry considerably more coal than the "Rurik," and the speed has been increased, as the 18 knots of the "Rurik" are not considered sufficient for ocean cruisers; the increased speed is also to be obtained without the necessity of using forced draught. Four of the 18 new torpedo-boats under construction have been launched, but the details of these boats have not transpired. ("Riv. Marittima.")

Rear-Admiral Avelan has hoisted his flag on board the 1st class armoured cruiser "Pamjat Azova," and has left for Cadiz, where the squadron which is about to proceed to Toulon is to assemble. It will consist of the 1st class battle-

ship "Imperator Nikolaj I," to which ship the Admiral will transfer his flag, the 1st class armoured cruiser "Admiral Nahimov," the protected cruiser "Rynda," and the gunboat "Teretz," in addition to the "Pamjat Azova." It is not yet settled how many of these ships will remain to form the future Russian Mediterranean Squadron. ("Petit Var.")

A specimen of some nickel-steel armour plates, which have been manufactured at the works of M. Schneider, at Le Creusot, for the new Black Sea battle-ship "Tri Sviatitelia," has been tried at that place in the presence of the members of the Russian Naval Commission, and has given some remarkable results. The plate measured 8 ft. by 8 ft., and was 15·9 in. thick. The conditions of acceptance were that it should receive four blows from Holtzer projectiles of chrome steel, weighing 317 lbs. apiece, and fired from a 9·4-in. gun with a striking velocity of 1,945 ft.-sec.; and it was also stipulated that no piece of the target should be broken off, and in no case should the base of the projectile penetrate the target to a depth of as much as 7·8 in. The four rounds were fired at the angles of a square which was painted on the centre of the target, and which measured 4 ft. each way. The order of the shots was—(*a*) right lower corner, (*b*) left lower corner, (*c*) left upper corner, (*d*) right upper corner, and the following were the striking velocities and injuries to projectiles and plates:—(*a*) Velocity, 2,000 ft.-sec.; penetration of the point of projectile, 14·1 in. The projectile flew backwards, with the point smashed and the shoulder somewhat set up. The target showed three very fine cracks running from the wound. (*b*) Velocity, 1,923 ft.-sec.; penetration of point of projectile, 10·9 in. The projectile flew backwards, broken into numerous fragments. As before, three fine cracks developed in target. (*c*) Velocity, 1,923 ft.-sec.; penetration, 14 in. The projectile flew back, with head smashed and the cylindrical part somewhat set up. A single fine crack was remarked. (*d*) Velocity, 1,962 ft.-sec.; penetration, 9·9 in. The projectile flew backwards, broken into numerous fragments. No fresh cracks, and old ones not increased.

Examination of the back of the target revealed the existence of low swellings from 1 in. to 1·7 in. in elevation behind each point of impact. Behind points (*a*) and (*b*) there were some fine cracks, behind (*c*) and (*d*) there were no cracks. The Trial Committee expressed complete satisfaction with the resistance and toughness of the plate.

MILITARY.

Argentine Republic.—The composition of the Argentine army, according to the recent scheme of reorganization, is as follows:—

12	regiments	of infantry, each of 2 battalions of 250 men.
10	„	cavalry.
1	„	mountain artillery.
4	„	field artillery.
1	„	engineers.

The normal strength of the several branches of the Service is as follows:—

Infantry	254	officers.	3,743	men.
Cavalry	183	„	1,887	„
Artillery	114	„	1,205	„
Engineers	13	„	161	„
Total	564	„	6,996	„

According to the "Deutsche Heeres-Zeitung," there are wanting to complete 259 officers and 4,104 men.

Austria-Hungary.—The recent manœuvres at Güns, in Hungary, were the largest that have ever been organized in Austria. The troops engaged, which

formed two armies, consisted of 164 battalions of infantry, 99 squadrons, 300 guns, 2 battalions of pioneers, and 2½ bridge trains. The battalions, being raised to two-thirds of the war establishment, comprised about 130,000 combatants, and the staffs and train were practically at war strength.

Denmark.—It would appear that the adoption of portable metal shields for the protection of infantry has been decided upon by the Danish authorities. Last year the sum of 75,000 crowns was voted for trials and for the purchase of Captain Holstein's infantry shields, and the Extraordinary Budget for 1893-94 includes a fresh credit of 25,000 crowns for the further purchase of shields. The "Spectateur Militaire" of the 1st September has an article on the subject of the effect of artillery fire on these shields.

France.—As it is generally accepted that in very close country cavalry will be unable to carry out a sufficiently complete reconnaissance, especially since the introduction of smokeless powder, this duty will, under such circumstances (according to the "Deutsche Heeres-Zeitung"), be entrusted to infantry detachments composed of men specially selected from regiments for this purpose. The regulations for field service now in force contain no instructions on this subject, but it is reported that experiments are being carried out during the current manœuvres with the object of fixing the organization of reconnoitring detachments in the infantry regiments. These reconnoitrers are to proceed to considerable distances in advance to gain detailed information regarding the enemy, without allowing themselves to be drawn into any fights, and, after attaining this object, to retire and act as battle-patrols in front and on the flanks. Should the present experiments be successful, it is expected that the regulations for duties in the field, which are to come into force after the manœuvres, will contain definite instructions on this important subject.

During the last manœuvres with masses of artillery at the camp of Châlons, experiments were made with an instrument for the regulation of the indirect fire of artillery, the invention of Captain Froissard. It is said that these trials gave the most satisfactory results. With the help of this apparatus, a group of batteries, perfectly defiladed by an obstacle, such as high ground or artificial cover, was able to regulate its fire as easily as if it had not been masked, and had had a clear field of view. ("Spectateur Militaire.")

Experiments have lately been made at Grenoble with the object of determining the effect of infantry fire at long distances, and the results have proved that, contrary to the very general opinion, the fire of the Lebel rifle at 2,000 m. (2,187 yds.) is of considerable importance. At that distance 300 shots gave 50 hits (16·66 per cent.). The size of the targets is not given in the article in the "Spectateur Militaire," from which this note is taken. In war, of course, this percentage of hits would be very much diminished; but even supposing, as is usually assumed, that the hits in war would be only one-tenth of those obtained at the ranges, the writer of the article referred to arrives at the following conclusions:—A company of 200 men would easily fire 10 shots each in one minute, and these 2,000 shots would (at 16·66 per cent.) give 333 hits at the ranges, and, say, 33 on the field of battle. If the most rapid fire possible were employed, the result would be nearly double. Under these circumstances, the writer maintains that artillery could not take up a position in open ground, and that cavalry without the aid of some infantry would be helpless under such fire. It is of interest to note that General du Guiny, in his instructions to the 3rd Army Corps for the manœuvres of this year, directs that the infantry must not hesitate to open fire at 2,000 m. if an opportunity presents itself. It would appear, therefore, that the long-distance fire of infantry is not altogether looked upon with disfavour in France.

According to the "Deutsche Heeres-Zeitung," the cyclists, who believed that they possessed a warm advocate in General Loizillon, have been bitterly deceived. The War Minister has expressed his opinion that military cyclists would only be of use

in suitable ground; in time of war, quite apart from the consideration of the liability of their machines to damage, their employment would give rise to numerous mistakes, and only in the rarest cases could they replace cavalry. In short, cyclists could only be employed in fortress service, during grand manœuvres, and on certain and easy communications in rear of an army in war.

The method of carrying the carbine slung from the shoulder, which is at present in force in the French cavalry, has been found not to answer as well as was expected. Experiments are being made in 10 regiments during the current autumn manœuvres with three new patterns of slings, and a committee has been appointed to watch and report upon the trials. ("La France Militaire.")

A recent order of the Minister of War prescribes that when the commander of any party of troops meets another body of troops on the march or at manœuvres, he will, after paying the usual compliment, move forward and announce his name, the composition of his party, its strength, and the mission with which he is charged.

In connection with the recent exercises of the 12th Army Corps at Limoges, the Société Française de Secours aux Blessés Militaires (of which Marshal MacMahon is president) carried out a very complete and interesting exercise in mobilization, the hospital and nursing service being fully organized. Subjects for treatment were furnished by the sick and injured soldiers who passed through the railway station or were detained there during the exercises. ("Le Progrès Militaire.")

Instruction in fencing, which formerly formed a not unimportant part of the training of the infantry, and was a source of amusement for the men, has, owing to the shortening of the period of service with the colours and the increased demands in other branches of duty, been considerably restricted. Formerly the whole of the men were put through a course of fencing, but this is now confined to non-commissioned officers and certain men in their second and third years of service. In consequence of this step, the number of company instructors has been reduced to one prévôt or élève-prévôt per company. ("Militär-Wochenblatt.")

With the object of increasing *esprit de corps* in the reserve regiments, the regimental numbers are in future to be worn on the collars and head-dress of all ranks. ("Le Progrès Militaire.")

It is stated in the "Militär-Wochenblatt" that the introduction of a light mitrailleuse or quick-firing gun in the independent cavalry divisions is now under the consideration of the War Ministry. A similar gun is also to replace the 8-cm. gun in the mountain batteries. The gun which it is proposed to adopt is said to be so light that it can be carried, together with 2,000 rounds, on a single horse, and it is understood that it will be able to fire 600 rounds per minute.

Germany.—The "Militär-Wochenblatt," No. 79, gives a description of a field canteen for officers which has been designed by Dr. Düms, a German medical officer, and is manufactured by A. Söhlmann, of Leipzig. The whole of the cooking vessels, plates, cups, &c., are made of aluminium, and the weight of the outfit for six persons is only about 9 lbs. The canteen is made in sizes to suit from four to ten persons. In addition to a complete set of cooking and eating apparatus, this canteen is provided with a strong wickerwork cover, which is not only convenient for fetching rations in the field, and for the conveyance of warm meals to officers on outpost duty, &c., but is fitted so that the whole canteen can be carried by a man, on a cart, or on horseback. In this form, with certain additions for forming a field kitchen, the whole outfit for six persons weighs about 15½ lbs.

The "Tägliche Rundschau" gives the following anecdote from a letter written by a private of the German Colonial troops in Africa, from which the great penetrative power of the 1888 rifle may be gathered. One of the men fired at a group of three Hottentot scouts who were standing in line with him, one behind the other. All three fell, and when their bodies were afterwards examined, it was found that the same ball had passed through all of them.

Among the Krupp exhibits at Chicago is a so-called "bush gun," designed for use in the African bush and in countries covered with high vegetation. A description of the gun, which is extremely light, and can be taken to pieces for convenience of transport, is given in the New York "Army and Navy Journal" of 19th August, which also gives descriptions and illustrations of other novelties exhibited by the Krupp manufactory.

Trials are being made both in Prussia and Bavaria with several new patterns of infantry packs. The main peculiarities of these models are that the body of the knapsack is made lighter by the abolition of the wooden framework and the adoption of aluminium for all the metallic parts, such as buckles. The pack is divided into two main parts, so arranged that the lower portion, which contains the heavier and less necessary portions of the man's effects, can be quickly detached, leaving only the upper part (termed the "Sturmsack" or assault bag), which contains the reserve rations. This separation of the indispensable portions of the kit from the heavier and less frequently required part is made with the view of enabling the men to reduce their load to the minimum at the moment of making the assault, while, even if they temporarily lose the greater part of their kit, they will still have their three days' rations and aluminium water-bottle with them. The cartridge pouches in the Bavarian pattern have been rearranged, each of the two in front containing 45 rounds in place of 30, and the rear pouch holding 60 in place of 90, so that the total number of rounds remains 150 as before. ("Revue du Cercle Militaire.")

Russia.—Increased importance is attached to the necessity of training troops by means of manœuvres in unknown country, as distinguished from always practising in fixed camps, &c. Thus the entire 1st Guard Division, with its artillery and the 2nd Brigade of the 1st Guard Cavalry Division, was recently moved to the district Krasnoe-Selo—Gatschina—Jamburg, and specially exercised in the service of security and information. The operations were carried out as far as possible under service conditions, and even in the matter of supply the troops were required to make their own arrangements both as to transport and the procuring of food and forage. ("Invalide Russe.")

It appears from a recent article in the "Invalide" that the greatest value is no longer placed on the instruction of the cavalry in dismounted action with fire-arms, but that greater attention is being paid to the use of the *arme blanche*. The article points out that the Russian cavalry has at various epochs been very proficient in the use of the sword, as during the twenties and thirties of the present century, and again after the Crimean war until 1870. Although the regulations only require that individual officers should be able to fight with the sword, many commanding officers consider it requisite to instruct all under-officers and men employed as scouts; but so far this has not been extended to the men in the ranks. Many proposals have lately been made regarding the training of cavalry, and they all appear to include the demand that the dragoons, whose only weapon of defence is the sword, should be instructed in using it, and especially in fighting against the lance.

Switzerland.—The "Deutsche Heeres-Zeitung," No. 75, gives an interesting description of the Krnka Miniature Rifle, extracted from an article by Professor Hebler in the "Allg. Schweiz. Mil.-Zeitung." This weapon, which is primarily intended for sporting and target-shooting purposes, is only two-thirds the length of

an ordinary infantry rifle, and its weight is about 2·5 kilos. (5½ lbs.), as compared with 3·3 kilos. (7¼ lbs.), the weight of an ordinary small-calibre rifle. The calibre is 5 mm. (0·197 in.). It is intended to manufacture two patterns of cartridges for this rifle, one with a solid bullet, and one with a modification of the Krnka-Hebler tubular bullet. With the former, the ballistic qualities of the new weapon are at least equal to those of the existing 7·5- and 8-mm. rifles; while with the tubular bullet they are said to be enormously superior.

In the "Allg. Mil.-Zeitung," No. 75, will be found a full description of the clothing, armament, and equipment which have been adopted for the military cyclists who have now become a definite item in the Swiss military organization.

FOREIGN PERIODICALS.

MILITARY.

Militär-Wochenblatt.—No. 78. "A Field-firing Exercise on the Altvater Mountain" (with sketch). "The Practice Ammunition of the French Artillery." No. 79. "Review of the Latest Inventions and Discoveries, Chemical and Technical, affecting Military Art" (*continued*). "An Aluminium Field Canteen for Officers." "New Rifle in the United States (Improved Krag-Jörgensen)." No. 80. "An Instrument for Laying Guns in the Time of the Thirty Years' War." "Review of the Latest Inventions, &c." (*continued*). "New Regulations regarding the Distribution and Service of Officers of the Don Cossack Regiments." No. 81. "The Turkish Irregular Cavalry." No. 84. "Excerpts from the Military History and History of the Military Organization of Bavaria" (a notice of recent publications of the Bavarian General Staff). "The Foundering of H.M.S. 'Victoria'" (with two sketches). "The Italian Regulations regarding the Promotion of Lieutenants of Infantry and Cavalry." No. 85. "The Foundering of H.M.S. 'Victoria'" (*concluded*). "Reorganization of the French Marine Artillery." No. 86. "Cavalry Attacks in Peace Manœuvres." No. 87. "Review of the Latest Inventions and Discoveries, Chemical and Technical, affecting Military Art" (*concluded*). "How can the proper Care of our Horses be ensured?"

Neue Militärische Blätter.—September. "Colonel Ponchalon's Souvenirs de Guerre (1870—1871)" (*continued*). "The Imperial Yacht 'Hohenzollern.'" "The Foundering of the 'Victoria.'" "A Sketch of the Battle of Lübeck" (a continuation of the Essay on "The History of the Prussian Reserve Corps"). "Reminiscences of the Campaign of 1866 in Italy."

Jahrbücher für die Deutsche Armee und Marine.—September. "The Campaign of 1809 in the Tyrol, &c." (*concluded*). "Napoleon's Plan of Operations and the Assembly of his Army in September and October, 1806." "The Franco-German Paper War regarding the Armoured Turret" (*concluded*). "The Action of Cavalry against Infantry, and *vice versâ*, according to recent Experiences." "The Smallest Calibre for Rifles" (with reference to Major-General Wille's work on that subject). "What will be the Special Duty of Cruisers in the Naval Warfare of the Future?" "General Review of Recent Technical Improvements, &c." (includes a notice of Krupp's exhibits at Chicago, and of various trials of guns and fire-arms).

Organ der Mil.-Wiss. Vereine.—Heft 2. "From Metz to Sedan" (with 4 plates).

Journal des Sciences Militaires.—September. "Objectives, Directions, and Fronts" (*continued*). "The Tactical Instruction of Officers" (*continued*). "The

Education of the Soldier" (*concluded*). "Long-Distance Signalling from Captive or Free Balloons." "Battle Tactics of Infantry. Modifications which should be made in the (French) Infantry Regulations in order to meet the new Requirements of War." "The Campaign of 1814" (*continued*). "Remarks on the Political and Historical Geography of Central Europe" (*continued*).

Revue Militaire de l'Étranger.—August. "The German Instructions in Field Fortifications for the Cavalry" (with diagrams and details of the new collapsible boats issued to cavalry regiments). "The Great Italian Manœuvres of 1892" (*concluded*). "The New Firing Regulations for the German Field Artillery." "The Augmentation of the Cadres and the Reserve Battalions in the Austro-Hungarian Infantry." September. "The Servian Army in 1893" (a very complete account). "The Railways of the North-West of India."

Spectateur Militaire.—1st September. "Observations on the Attaching of Companies of Infantry to the Independent Cavalry Divisions." "Shields and Artillery" (a consideration of the protection afforded by portable infantry shields against artillery fire). "A Year's Column Work in Algeria" (*continued*). "Souvenirs and Lessons from History." 15th September. "General du Guiny's Instructions for the 3rd Army Corps" (Manœuvres of 1893). "The Shield and the Military Press." "Campagne de la Loire in 1870-71. Coulmiers et Orléans" (a lengthy notice of P. Lehautcourt's work). "A Year's Column Work in Algeria" (*continued*). "Souvenirs and Lessons from History" (*continued*.)

Revue du Cercle Militaire.—No. 36. "The New Firing Regulations for the Italian Artillery (26th May, 1893)." "Colonel Alexieff's Field Kitchen" (a vehicle designed for the transport of cooked meals for troops on the line of march or at distant out-quarters. The designation is misleading, as the vehicle is not designed for cooking, but merely for conveying cooked meals, and keeping them hot for six or nine hours). "The Normal Calibre for the Infantry Rifle" (*concluded*). No. 37. "The Swiss Army in 1892." "Our Naval Manœuvres—An English Criticism." "The New Firing Regulations for the Italian Artillery" (*continued*). No. 38. "The Grand Manœuvres of 1893." "The New German Field Fortification Regulations." "The New Firing Regulations for the Italian Artillery" (*continued*). "The Swiss Army in 1892" (*continued*). No. 39. "The Grand Manœuvres of 1893" (*continued*). "The New German Field Fortification Regulations" (*continued*). "The Swiss Army in 1892" (*continued*). No. 40. "A French System of Light Bridges for Infantry." "The Grand Manœuvres of 1893" (*continued*).

Revue de Cavalerie.—August. "Letters of a Cavalryman—Synthesis and Conclusion." "The Gardes d'Honneur Regiments (1813-14)." "The Horse. By a Breeder" (*continued*). "The Paces of Horses revealed by the Experimental Method" (*continued*). September. "Horse-racing in the Army." "The Gardes d'Honneur Regiments" (*continued*). "The Supply of Men and the Remounts of the Cavalry of the Grand Army in 1806-7" (*continued*). "The Paces of Horses" (*continued*).

Revue du Service de l'Intendance Militaire.—July-August. "Statistical Notes on the Resources at the Disposal of Paris for an Army charged with its Defence." "The Administration of the Austro-Hungarian Army" (*continued*).

Revue Militaire Suisse.—September. "Critical Observations on the Organization of the Swiss Infantry" (*concluded*).

NOTICES OF BOOKS.

Far Cathay and Farther India. By Major-General A. RUXTON MACMAHON, formerly H.M. Political Agent at the Court of Ava. London: Hurst and Blackett, 1893. Pp. 340. Price 12*s.*

Lord Palmerston is reported to have said, "If you want to be thoroughly misinformed about any country, consult a man who has lived there 30 years and knows the language perfectly." General MacMahon possesses, doubtless, an unusual endowment of the qualifications for misleading us which were so paradoxically stated by the witty Minister, but, fortunately, he has not so applied them. He gives a great amount of information about the origin, migration, and history, the religions, and social and political condition of the various races that inhabit the countries in connection with the North-Eastern and Eastern provinces of British India; he tells us little, however, and that little only incidentally, of their fighting among themselves and with us. His knowledge of the history of the countries he writes about is based on extensive reading and critical study of the best works, and his views of the destinies of those countries in the near future are characterized by impartiality and moderation. The author has, apparently, no crotchets to advocate; no pet theory to which the course of events must be accommodated. A vein of dry humour pervades the book, and enlivens many passages which, but for this, might possibly seem dull to the average reader. The illustrations are excellent, artistically drawn, and finely executed. The work, which is carefully written, and contains but few verbal inaccuracies, can be cordially recommended as a reliable and interesting account of the countries described.—O'C.

Artillery, its Progress and Present Position. By E. W. LLOYD, late Commander R.N., and A. G. HADCOCK, late R.A. J. Griffin and Co., 1893. Price 31*s.* 6*d.*

We have no hesitation in strongly commending this work to the largely increasing section of the public which takes an interest in artillery matters; and we hail its appearance with satisfaction, all the more that it deals with its subject from a broad point of view, so as to render intelligible to an uninstructed reader matters which there is an occasional tendency to represent as professional *arcana* beyond the comprehension of the layman.

Not only will the book be found useful to those who are not artillerymen by profession, but it must also prove of great value to a large number of naval and artillery officers who, from one cause or another, have been unable to keep themselves in touch with the rapid progress made in artillery matters of late years. A perusal of "Artillery and its Progress," combined with a short course of instruction either on the "Excellent" or at Shoeburyness, should suffice to place such officers—and there are not a few of them—on a level with the science of the day.

The ground covered by the book embraces every branch of the subject, not omitting a most instructive sketch of the history and progress of artillery; the more scientific aspect of the arm is relegated to a separate part of the book —Part II—which treats exclusively of ballistics; there are interesting notes upon minor points in an appendix; and last, but not least, the illustrations with which the work is plentifully garnished are of a most admirable description. In spite of the variety and number of branches under which the subject is treated, the authors have not been betrayed into undue prolixity; on the contrary, their lucid and concise handling of the various points is most striking.

We will make but one remark on the subject matter contained in the book, and that is that we do not entirely share the assurance of the authors as to the pre-eminent position occupied by England in artillery matters. In many points, no doubt, we are well ahead; but a study of the comparative table (borrowed from Colonel S. C. Pratt's "Field Artillery"), opposite p. 280, will show how much we have sacrificed in order to obtain a high velocity in our field gun (as to the doubtful value of which see the pertinent remarks on p. 289 *et seq.*). It is well to be confident in our manufacturing powers, but self-satisfied optimism has ere now played sad havoc with our artillery material.—M.

Illustrated History of the Scottish Regiments. Book 3. Queen's Own Cameron Highlanders (*79th Foot*). By Lieut.-Colonel PERCY GROVES. Illustrated by Harry Payne. W. and A. K. Johnston, 1893. Price 3*s.*

The third number of the series is equal in every respect to its predecessors, the histories of the Black Watch and Scots Greys. The coloured illustrations give a good idea of the uniforms worn by the regiment at various times from its embodiment as the "Cameronian Volunteers," in 1794, to the present date. It is announced that the next number of the series will be the history of the Argyll and Sutherland Highlanders.

LIST OF RECENT FOREIGN BOOKS (MILITARY).

Du Rôle de l'Artillerie dans le Combat de Corps d'Armée. By Commandant DUCASSÉ. Paris: Baudoin, 1893. 1 fr.

Napoleon und Bernadotte im Herbstfeldzuge 1813. By Dr. ERNST WIEHR. With 6 sketches. 496 pp. Berlin: Cronbach, 1893. 7 mks. 50.

Von 1807 *bis* 1893. *Zur Entwickelungsgeschichte unserer Heeresverfassung.* By Lieut.-Colonel E. KNORR. Berlin: Peters, 1893. 2 mks.

Die Kritik in ihrer Anwendung auf das Studium der Kriegsgeschichte und auf die militärische Praxis. By Major A. HUBL. Graz: F. Pechel, 1893. 1 mk.

A plan of the field of Waterloo on the scale of 1/20,000 has recently been published by the Belgian Institut Cartographique Militaire, being a reproduction of the plan prepared by W. B. CRAAN in 1816, the portions of map on which the positions of the troops are shown being also given on a larger scale. The publication is accompanied by a narrative of the various phases of the battle. The published price is 70 c.

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